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ENTERPRISE SUPPORT POLICIES IN DYNAMIC EUROPEAN REGIONS

by

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ACKNOWLEDGEMENTS

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ACKNOWLEDGEMENTS

This study has been made significantly easier to conduct than it might have been due to the advice, assistance and research support of the following individuals and organizations: Dr Rory O’Donnell and Mr Noel Cahill of the National Economic and Social Council, Dr Eoin O’Malley of the Economic and Social Research Institute and Christoph Adametz of the Technical University of Graz, Austria. Thanks to Dan Flinter and Mike Feeney of Forbairt, Brian Cogan and Declan Hughes of Forfás, David Croughan of the Irish Business and Employers Confederation, Paul Haran of the Department of Enterprise and Employment and representatives of FÁS, the Irish Trade Board, IDA, the Irish Congress of Trade Unions, Shannon Development and the Department of Enterprise and Employment. I would also like to thank Dr. David Jacobson and Paddy Teahan for their insightful comments. None bears any responsibility for the evidence and judgements contained herein.
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# EXECUTIVE SUMMARY

1. Enterprise support in the dynamic growth economies examined has a consistent theme of encouraging co-operation amongst firms and agencies to enhance competitiveness overall.

2. Where, as in Denmark, there was little tradition of inter-firm co-operation amongst SMEs, a programme to foster business networking has been successfully designed and implemented.

3. Industrial clusters are also a key feature of successful European economies. Ranging in scale from Italian industrial districts to Baden-Württemberg’s regional engineering clusters, these are vertically and horizontally linked supply and subcontracting chains in interaction with public and private enterprise support services.

4. Examples of regions developing cluster systems are Wales, where clusters have emerged around foreign direct investment and Steiermark (Austria) where an automotive cluster is being built through public-private partnership.

5. The Irish economy has a strong foreign direct investment sector, especially in high technology, which is weakly integrated with the domestic supply base. Indigenous manufacturing is vulnerable, although performing better than hitherto in export markets. Irish firms need to become more innovative, to improve learning capacity and interact more with other firms to enhance competitiveness.

6. There is no strong evidence that Ireland has an integrated National System of Innovation unlike other smaller European economies, notably in Scandinavia, where such systems facilitate interactive learning and focused business competitiveness.

7. It is recommended that efforts should be made in Ireland to promote a co-operative ethic among firms and with State development agencies. This will have the objective of developing interactive innovation and demonstrating the importance of co-operation to achieving competitive advantage.

8. A National System of Innovation should be put in place through the adoption of a Technology Policy Concept. This will integrate the diverse scientific and technological institutions and, as appropriate, assist Irish firms to improve their innovativeness.

9. A Network Co-Operation Programme should be established to stimulate horizontal co-operation amongst the indigenous, small
firm, manufacturing sector. This programme should be modelled upon that developed in Denmark with a brokerage system and an incentives package costing no more than £20 million over three years.

10. The already proven National Linkage Programme should be expanded to include more firms seeking to become members of vertical supply-chains, especially relating to the successful foreign direct investment sector. A further £15 million over three years should be added to this budget.

11. Sections of indigenous manufacturing such as furniture, printing and publishing, engineering, knitwear and food which are reasonably strong, should be first targeted for the Network Co-Operation Programme.

12. Subsequently, enterprise support for wider cluster formation should be provided to link, where appropriate, ‘networks of networks’ around areas of major economic strength such as food, pharmaceuticals and electronics. All these policy measures should be closely monitored and evaluated and good practice disseminated throughout Irish industry with a view to integrating innovative governance and competitive business in an ‘economic partnership’ to complement Ireland’s successful experiment in ‘social partnership’.

The objectives of this report are matters of interest:

- To elucidate recent supply mechanisms associated with the provision of inputs to the programme.
- To review the experience of the programme and the relevance for the case of the Irish model.
- To explore these cases, Germany (Baden-Württemberg) and other regions (such as Steiermark), with a view to the development of a more networked and systems based approach.
- To assess, by reference to the World Bank’s experience, the receptivity of Irish firms to measures and instruments used in comparator economies.
- To draw conclusions and recommend appropriate policy steps towards achieving a more integrative governance in Irish economy.

The first main chapter of the report proceeds with an examination of the hierarchical organisational structure of the programme. The contribution made by evolutionary economics to the programme is highlighted. It is suggested that the importance of the programme lies in the fact that it is a model for the development of a more integrated and competitive business environment in Ireland. The programme is characterised by the cooperation between firms, and the role of associations and intermediaries in the development of the programme is highlighted. The characteristics of both top-down and bottom-up approaches are reflected in the programme, with a significant degree of self-governance by both firms and associations.
This programme should be modelled on the Social Linkage Programme. It should be open to all firms entering a foreign market, involving a brokerage system and firms with no more than 20 million over three years of operation.

The objectives of this report are fivefold and deal with the following matters of interest:

- To elucidate recent scholarly thinking on the underlying mechanisms associated with dynamic economic growth;
- To review the experiences of five regions or countries which have relevance for the case of Ireland, being endowed with traditional sectors, SMEs and proactive governance organisations;
- To explore these cases, in Italy (Emilia-Romagna), Denmark, Germany (Baden-Württemberg), UK (Wales) and Austria (Steiermark), with a view to assessing the importance of networked and systems integrative measures in supporting economic dynamism;
- To assess, by reference to a policy analysis of Irish industrial policy, the receptivity of Irish business and governance structures to measures and instruments such as those deployed in the comparator economies;
- To draw conclusions and recommendations regarding the most appropriate policy steps that might be taken to encourage systems integrative governance in support of Irish enterprise.

The first main chapter of the report explores the implications of the global transition towards a model of industrial co-ordination in which hierarchical organisational structures are moderated by network forms of co-ordination. The contributions to understanding of these processes made by evolutionary economics and industrial district theories are given special prominence. It is suggested that there is a strong case for recognising the importance of co-operative relationships amongst firms as the, perhaps, hidden dimension of competitive advantage. It is stressed that economies which, like Ireland, have adopted a social partnership model at macro-level tend also to have adopted a "high-road" strategy at the level of individual and collective entrepreneurship. Within this approach innovation becomes a crucial factor to competitiveness more generally. Innovative, co-operative economic organisation is characterised frequently by network relationships amongst firms and between firms and the system of governance, including private associations and intermediary institutions. Innovative learning is also a characteristic feature of both sets of actors. This report advocates moderation of top-down state-led initiative and the stimulation of more responsible self-governance by intermediaries and firms in association.
In Chapters 3 to 6, detailed case studies are provided of the regional systems of Emilia-Romagna, Baden-Württemberg, Steiermark and Wales. These regions were selected since they fulfilled the criteria of relevance to the aims of the report. To these regions is added the case of a northern European, peripheral, national economy – that of Denmark – which, despite sharing some features in common with Ireland, has performed better economically over the past decades. The regional economies combine a mixture of significant small-firm presence, traditional sectors, something of a rural, agricultural backcloth and the absence of major, metropolitan centres of advanced producer and other financial services. In different ways, each of these cases bears witness to the importance of a propensity towards partnership, networking, co-operation amongst firms both horizontally and vertically. Moreover, each reveals the importance of innovative governance in a judicious mix of public and private intervention in enterprise support, which, at its strongest results in a seamless system integration of research, training, government incentives, private intermediary activity and business linkage whereby the whole becomes an innovative cluster, a treasured goal of much contemporary economic policy-making.

In Chapter 7, the receptivity of the Irish economy to such thinking and policy is assessed. In a review of Irish industry policy it is shown that, from an era when great effort was put into the attraction of innovative foreign investment, the mood has shifted towards seeking to integrate the overseas and indigenous sectors more effectively. Without suggesting that the extraordinarily successful inward investment programme of the IDA should be in any way weakened, the report points to the need for upgrading of Irish domestic industry to assist it to meet the exacting targets of inward investors. While the National Linkage Programme has been successful in supporting this aim, there is moderate criticism that it may have been insufficiently inclusive in this approach. Cluster-building and network programme-type support and moves to align the Irish National Innovation System more closely to the needs of domestic and foreign industry seem to be called for if Irish industry is to become more Innovative.

THEORETICAL ISSUES TO SYSTEM

1. INTRODUCTION

New times call for new concepts, which are introduced here, in part to reframe this study of the fast country/regional industrial dyad mechanisms deemed appropriate sustainability in those contexts. Informal non-hierarchical, org integration is the approach to go; partnership – minded (Abe, 1995).

Not so long ago, it was considered that mass-production in manufacturing in the first quarter of the present the template nor the exemplar led; the 1980s. The question of whether whether it had passed into a post brains of innumerable writers (Boyce, the recent collection in Amin, been made to ‘post-Fordist lox Goodwin, Duncan & Halford, I household’ (Marsden, 1995). The form as the New England meeting twice a year only to hand out the cost private contracting firms.

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CHAPTER 1

THEORETICAL ISSUES: FROM NETWORKS TO SYSTEMS INTEGRATION

1. INTRODUCTION

New times call for new concepts, and the two in the sub-title to this chapter are introduced here, in part to register the underlying conceptual approach taken in this study of the fast-moving field of contemporary small country/regional industrial dynamics and the enterprise support mechanisms deemed appropriate for both competitiveness and sustainability in those contexts. In brief, ‘networks’ refers to formal and informal non-hierarchical, organisational arrangements; ‘Systems integration’ is the approach to governance which is holistic, inclusive and partnership – minded (Abe, 1995).

Not so long ago, it was considered intellectually risky to posit an argument that mass-production in manufacturing, modelled on the lines introduced in the first quarter of the present century by Henry Ford, was no longer the template nor the exemplar leading-edge companies looked to in the 1980s. The question of whether Fordism persisted as neo-Fordism, or whether it had passed into a post-Fordist stage, exercised the pens and brains of innumerable writers (Boyer, 1986; Lipietz, 1987; Cooke, 1988; see the recent collection in Amin, 1995). By 1995, reference had already been made to ‘post-Fordist local government’, (see, for example, Goodwin, Duncan & Halford, 1993) not to mention the ‘post-Fordist household’ (Marsden, 1995). The former is characterised in its ultimate form as the New England meeting house at which the town council meets twice a year only to hand out the contracts for service delivery to a myriad private contracting firms.

So, it seems likely that the hierarchical, structured, compartmentalised, bureaucratic mode of organisation and economic co-ordination is in retreat as a model of best practice. It may, indeed, have exhausted its creative possibilities, despite the injunctions of Max Weber (1980) (who saw bureaucracy as the highest, most rational point in the development of social organisation) and be about to disappear, at least as a text-book model of how best to allocate resources with efficiency and equity. From the era of the Keynesian welfare state, many Western countries now operate on something a little closer to what Jessop (1993) calls the ‘Schumpeterian workfare state’. The point here is that for reasons
of political ideology but also the perceived need for fiscal rectitude, many countries have been pursuing policies to rein in welfare expenditure rather than use it as a demand management pump-priming mechanism. Schumpeter, of course, was the theoretician of entrepreneurship, enterprise and innovation as the wellsprings of capitalist competitiveness (Schumpeter, 1944). Workfare is the idea, promoted by the Clinton administration in the USA, that the right to welfare should be earned not only through contributions made while in employment, but by actual work on schemes by means of which welfare income is itself earned.

Hence, many of the structures and assumptions of the Fordist manufacturing and Keynesian welfare era, especially from 1945 to 1975, have been placed in question if not, as in the UK particularly, been seriously eroded by neo-liberal government policies. However, by no means all European member-states have experimented with state disintervention to the extent the UK has. The Republic of Ireland is a case in point where, not only does the state take the lead in widespread areas of industrial policy, but latterly a quite European model of 'social partnership' between capital, labour and the state appears to have brought real gains to the budgetary and exchange-rate stability of the economy. (O'Donnell, 1995).

2. SOCIAL PARTNERSHIP AND THE 'HIGH ROAD' TO ECONOMIC DEVELOPMENT

There is good evidence of long-term success both economically and socially in smaller countries, such as Denmark, Norway and Austria, as well as larger ones, notably Germany, that have operated with an economic policy rooted in established institutional support for social partnership. Social partnership is taken as given for the purposes of this study of Irish prospects for emulating the rates of growth in economic well being in such countries. The alternative of a neo-liberal policy lurch of the kind experienced in the UK is far less likely than the also, hopefully, unlikely unravelling of the social partnership edifice that has so carefully, even painfully, been put into place in Ireland. And, in any case, a social partnership model of economic organisation is responsible for what, in such countries, is often referred to as a 'high road' industrial development strategy and process.

A 'high-road' strategy is one in which the aim is to develop an economy characterised by a high value-added profile in its output of goods and services, a high skills profile in its workforce and high wages amongst its citizens. The alternative of a 'low-road' strategy tends to be associated either with those Southern European developing economies that have based their competitiveness on the 'asset' of low wages, such as Portugal, Spain (though this is changing), deregulated economies such as low-skill and low value-added countries in Asia and Latin America.
need for fiscal rectitude, many to rein-in welfare expenditure on pump-priming mechanism, eoretician of entrepreneurship, rings of capitalist competitiveness idea, promoted by the Clinton pro welfare should be earned not tie in employment, but by actual welfare income is itself earned.

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The problem for 'high-road' countries or regions, is that they must embark on a route in which innovation and enterprise are permanent and fundamental features of the economy. High wages must be paid for by high productivity and low unit labour costs, with innovative, high-quality and reliable goods and services selling competitively on the global market. This has to be the aspiration for Ireland since it is the case that the more dynamic growth regions in Europe, not to mention countries such as Denmark, have this characteristic. That is not to say Ireland should be expected to achieve that condition overnight, but its qualities and advantages should be well-understood as an aspiration and objective both of policy and business activity. Even achieving a 'middle road' developmental path in the short-to-medium term is better than taking the ultimately unsustainable 'low road'. In high road economies, it is recognised that the problem of the SME is not only its size but its isolation. Small firms simply cannot afford sophisticated domestic, let alone global, marketing or technology-transfer in most cases. The complex demands of increasingly exacting customers pose new problems concerning quality, reliability, deliverability and so on. Governments try to compensate, but not always in sufficiently innovative ways, so SME innovation increasingly depends on closer links between firms and research institutes for example. Sometimes these risks are so great they must be spread amongst firms -- as we will see in the Baden-Württemberg case -- with the state giving incentives. These relationships rely on trust first, not market contracts. The 'high-road' economy is also a 'high-trust' system where firms assist each other to be competitive in their own market areas or niches. This is well-exemplified in the reconversion region of North Rhine-Westphalia in Germany where there is abundant labour occasioned by restructuring in coal, steel and textiles. Despite this, industrial policy is based on increasing workforce skills:

(i) to manage the growing complexities of closer buyer-supplier interactions in the production chain;

(ii) to capitalise on closer innovation links between industry and research institutions;

(iii) and because growth is no longer anticipated in opportunities for the manufacture of standard products (Cooke, 1995).
Of course, Germany is a high-wage, high labour-cost country but the 'low-road' is not considered an option for making economic progress.

3. **HIERARCHY TO HETERARCHY: AN EVOLUTIONARY APPROACH**

A case has been made that hierarchical 'top-down' management of economy and society is in retreat, especially with respect to the question of industrial co-ordination. Firms that once reigned supreme as self-sufficient, substantially capable of meeting demand for goods and services internally – IBM, Philips and General Motors spring to mind – now routinely source from a more or less structured 'supply-chain'. This, at its most elaborate, links the final customer to a, possibly large, systems supplier at first-tier level and a number of second and third-tier components, 'A' parts and 'non-A' parts firms of diminishing size in a linkage arrangement of quite startling potential fragility. In the process, some significant element of the hierarchical power of the customer firm is lost. In some recorded instances, (e.g. Semlinger, 1992) suppliers have organised themselves into associations to exert 'supplier power', mainly defensively, to prevent divide-and-rule pricing strategies by customer firms.

If hierarchy is in retreat, then does the market take its place as the prime mover in economic co-ordination as economists from Coase (1937) to Williamson (1985) have suggested? Interesting research originating in the evolutionary economics approach and, independently, in some of the work of Italian theorists of neo-Marshallian industrial districts suggests otherwise. Such districts are composed of networks of small firms linked by both co-operative and competitive imperatives to the extent that they have become globally competitive (Becattini, 1989; Brusco, 1990). They are clearly 'in the market' but their relationship with other firms is not simply organised through the cash nexus and 'arms-length exchange'. They collaborate in order to overcome the weaknesses of small-size, though they are profit-maximising when they sell their products on the (increasingly global) market.

In evolutionary theory, firms are conceived of as collective organisations, with a certain degree of resource-development capacity of their own. They are not homogeneous, atomistic units of rational utility maximisation, as in neo-classical theory. Rather they are differentiated, make use of variable proportions of non-homogeneous inputs and, crucially, they are capable of learning through the 'double feedback loop' (Argyris & Schon, 1978) of assessing both their own experience and that of their peers. This is very similar to the view of authors such as Becattini & Rullani (1993) that it is product and agencies in a dis-sustainability of a disaggregated system. Belussi (1996) goes between evolutionary and in developmental lags between co not as a product of lack of reso technical capabilities to apply in an up-to-date way. Such capita but not pre-determined; they can feasible innovation opportunities.

Unlike the neo-classical world technology and learning gains as evolutionary world is one in which chance effects occur. The interaction with other firms and itself modified as well as the diffusion of both codified and tacit equal relationship to one another outside their domestic base but within it, is an important source of competitive edge in traditional wage, less developed economies.

Such relationships are not in Heterarchy is the condition in when trust, reputation, custom, recip and an inclusive and empowers disempowering disposition (Co) heterarchy does not operate in a more than evolutionary economic socio-cultural milieu (Maillat, 1975) inter-firm organisation are embedded here talking about community in about routine practices and mental of a commercial community. As M rightly appreciated, inventions processes and the general organisational promptly discussed; if one persons and combined with suggestions of further new ideas' (Mars
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**WHY: AN EVOLUTIONARY**

al 'top-down' management of ally with respect to the question t at once reigned supreme as meeting demand for goods and eneral Motors spring to mind – structured 'supply-chain'. This, mer to a, possibly large, systems rber of second and third-tier is of diminishing size in a tential fragility. In the process, ical power of the customer firm (Feininger, 1992) suppliers have exert 'supplier power', mainly pricing strategies by customer

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Unlike the neo-classical world of isolated utility-maximisers for whom technology and learning gains are exogenously given (Romer, 1990), the evolutionary world is one in which innovative, imitative, unpredictable and chance effects occur. These have the consequence that, through interaction with other firms and agencies, the economic environment is itself modified as well as exerting its own modifying effects. The diffusion of both codified and tacit knowledge among firms in relatively equal relationship to one another, especially where they are competitive outside their domestic base but complementary, or even collaborative within it, is an important source of competitive advantage for small firms. This is why industrial districts have proved capable of maintaining a competitive edge in traditional sectors despite competition from low wage, less developed economies.

Such relationships are not **hierarchical**, they are **heterarchical**. Heterarchy is the condition in which network relationships pertain based on; trust, reputation, custom, reciprocity, reliability, openness to learning and an inclusive and empowering rather than an exclusive and disempowering disposition (Cooke, 1995; Boisot, 1995). However, heterarchy does not operate in a vacuum. Industrial district theory, even more than evolutionary economic theory, stresses the importance of the socio-cultural **milieu** (Maillat, 1991) within which network forms of inter-firm organisation are embedded (Granovetter, 1985). We are not here talking about community in a simplistic and generic way, rather about routine practices and mentalities of entrepreneurship in the context of a commercial community. As Marshall (1919) put it: ‘... good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the businesses have their merits promptly discussed; if one person starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas’ (Marshall, 1919).
Having set up this theoretical and, to a considerable extent empirically informed, exemplar of networked business co-ordination, let me now identify some, possibly debilitating, weaknesses that have recently been identified in the canonical neo-Marshallian form of the industrial district. Writing from an evolutionary economics perspective also, Varaldo and Ferrucci (1996) have identified the following developmental blockages presently visible in the district form of development. First, because of strategic co-operation between firms in districts there develops, of necessity, a common set of strategic expectations about behaviour amongst mutually dependent entrepreneurs. Institutional memory, rules, routines, ways in which mutual expectations are regulated, relationships ordered and rules governed, come to converge so that dissonance within the district becomes muted. This, the absence of dissenting voices, reproduces district culture – in the commercial sense – but may delay strategic creativity at critical points when a rapid response to the need for innovation is required.

Second, this is not a problem until the district system experiences an exogenous shock, such as a stabilisation, or even, as occurred in the global recession of the early 1990s, a contraction in demand. This can cause a number of panic responses: competition may become cut-throat and destructive; low prices make investment in restructuring impossible; reduced demand limits the high flexibility levels associated with district firms, revealing hidden costs as margins are cut and more standardised production is resorted to; firms seek cheaper offshore suppliers and even production locations; retail customers are more able to negotiate favourable contracts for themselves; new technologies may represent a threat where they are incongruent with the technical know-how of district entrepreneurs. All these reactions can be experienced in non-district settings too, and there is even limited evidence that in Italy, during the 1990s recession, district firms fared better than similar ones outside districts (Franchi, 1994).

4. BEYOND THE INDUSTRIAL DISTRICT: FROM CLUSTERS TO SYSTEMS INTEGRATION

So, the question is, can we have the advantages of networks without the disadvantages of the herd instinct? This question is particularly apposite in the sense that, while many who are responsible for promoting economic development in the different countries of the world admire the Italian and other industrial districts, very few have them in their own bailiwicks. Most economic development involving enterprise support for small and medium enterprises occurs in situations far removed from the industrial district model of development. Poignant conclusion, is that even firms relies more and more on the networks of global firms. Instead for the future is of more local relationships. These may be incremental innovation made possible where close networks facilitate relationships. But for the more dynamic, strategy competitiveness is sustained, firms not necessarily directly, but through networks.

Mention of clusters inevitably raises the question of whose work on competitive adoptions and regions seeking to enhance competitiveness through sup national discussion about the trend toward optimising the use of smaller firms, amongst each other as suppliers, the interest in collaboration and competition, and the ‘lock-in’ problems that bedevil firms. The extent can collaborative imperative for firms to become sustaining competitive advantage.

Here, the view of Porter’s colleague is helpful. He begins by arguing that the dynamic between collaboration and competition is, on the one hand, collaboration that, on the other, when it comes to innovation, because they will have both foreign meet in the market. He concludes that the optimal mix of collaboration (which may also identify the activities best suited for collaboration, for firms, means resources against the potential information to competitors. For example, the support their policies may even...
In a considerable extent empirically iness co-ordination, let me now asknesses that have recently been form the industrial district, perspective also, Varaldo and allowing developmental blockages of development. First, because of districts there develops, of expectations about behaviour ours. Institutional memory, rules, questions are regulated, relationships converge so that dissonance within the absence of dissenting voices, commercial sense — but may delay in a rapid response to the need for

e district system experiences an, even, as occurred in the global function in demand. This can cause a ton may become cut-throat and ent in restructuring impossible; ity levels associated with district is are cut and more standardised paper offshore suppliers and even rs are more able to negotiate new technologies may represent a technical know-how of district be experienced in non-district evidence that in Italy, during the better than similar ones outside

**ITAL DISTRICT: FROM EGRATION**

antages of networks without the question is particularly apposite for promoting economic the world admire the Italian and them in their own bailiwicks. enterprise support for small and far removed from the industrial district model of development. Varaldo and Ferruci’s (1996), rather poignant conclusion, is that even in the Italian case, the future of district firms relies more and more on their capacity to make links to non-district firms displaying strategic competitive advantage, including crucially, networks of global firms. Instead of tightly-defined districts, the model for the future is of more loosely-defined ‘clusters’ of inter-firm relationships. These may be capable of taking advantage of the incremental innovation made possible in periods of relative stability where close networks facilitate rapid information diffusion and learning. But for the more dynamic, strategic innovations by means of which global competitiveness is sustained, firms in local networks need to be in touch, not necessarily directly, but through the supply-chain, with global networks.

Mention of clusters inevitably introduces the name of Porter (1990) whose work on competitive advantage has been widely adopted by countries and regions seeking to identify and enhance their world-class competitive potential through supporting industry clusters. In light of the discussion about the trend towards networking as a competitive strategy by smaller firms, amongst each other as sub-contractors or towards large firms as suppliers, the interest in cluster theory lies in the relationship between collaboration and competition. Given what we have said about the ‘lock-in’ problems that bedevil industrial districts the key question is: to what extent can collaborative inter-firm relationships help fulfil the imperative for firms to become increasingly innovative as a means to sustaining competitive advantage?

Here, the view of Porter’s colleague Michael Enright (1995) is helpful. He begins by arguing that the debate which stresses incompatibilities between collaboration and competition is redundant. Correctly, he asserts that, on the one hand, collaboration means more opportunity for firms to share in bulk purchasing, joint marketing and basic training, but on the other, when it comes to innovation, firms will also need to be competitive because they will have both foreign, and possibly local, competitor firms to meet in the market. He concludes by suggesting the way through this is to identify the optimal mix of collaboration and competition for a given industry cluster (which may also be a regional cluster). This means identifying those activities best conducted collaboratively and those not. Collaboration, for firms, means a trade-off between access to greater resources against the potential for loss of valuable, proprietary information to competitors. For policy makers, the trade-off is between the support their policies may even-handedly give to co-operation versus
the stimulus to growth supplied by tough local competition. The optimal mix optimises these trade-offs.

Porter’s angle on clusters tends, perhaps inevitably, to highlight competition in discussing strategic advantage. However, on inspection, his concept of the cluster includes very many collaborative dimensions. Such elements as the formation of ‘industry clubs’, interaction with ‘close-knit socio-cultural links’ and ‘willingness to co-operate’ are key features of the model of a competitively advantaged cluster. Taking these points on board, it seems that the answer to the question raised earlier, regarding the nature of the mechanism most likely to facilitate networked collaboration and innovative competition, is something we may refer to as the innovative industrial cluster, or if we wish to think geographically, we might designate it an innovative regional cluster.

Let us briefly explore these two related, but distinctive, elaborations of the basic cluster idea and, in the process, say more about the systems integration approach to thinking about how these may be co-ordinated. The systems dimension arises from the ‘membership’ of the network comprising the cluster. Minimally, as can be seen later in the chapter on Wales, the innovative regional cluster will consist of firms, large and small, comprising an industry sector in which network relationships exist or can be commercially envisaged, research and higher education institutions, private R&D laboratories, technology transfer agencies, chambers of commerce, business associations, vocational training organisations, relevant government agencies and appropriate government departments. This constitutes the basis for an integrative governance arrangement. The club, forum, working party, consortium or partnership model is what typifies this associative approach towards enhancing the commercial community (Casson, 1995; Hirst, 1994). From such arrangements institutional learning and innovation gains may more readily be acquired. Associative governance involves something of a shift from state-regulation of economic affairs to a degree of self-regulation by responsible groups in economy and society. In Hirst’s (1994) formulation, this means ceding some aspects of economic governance to associations (such as training or technology-transfer), supported by appropriate financial mechanisms. It also implies decentralised, transparent and consultative governance. Institutional learning is a crucial part of an associative approach. It presumes no fount and origin of all wisdom, rather it assumes the processes of economic development and especially, innovation are interactive processes in which institutions on the user-side (e.g. customers) may be as important as producers (e.g. scientists) of the innovations in question.

For the innovative industrial cluster defined in a region – the inter-electronic means, through vided learning of a more informal kind frequent meetings for working – tend to require establishment as a ‘net’ associationism may occur if the cluster requires not managers especially firms, mus network. Responsibility must interests to ensure continu learning-by-interacting, and so needs to be built-in to such area are the essentials of ‘economies’

Beyond these housekeeping details of theoretical relevance which it is the question of trust in networ which concerns the mechanisms by which are made.

5. TRUST AND MICRO-CO-OPERATION

In hierarchies, authority flows from the top down, authority is governed purely by utility-maximisation and control, that is, the category of infor, other hierarchical systems. In pondering the usefulness of introducing the notion of trust, it is useful to think about how to handle it. The product of systems is in its infancy, though Fukuyama’s general way.

Sabel’s (1992) case is that trust is an exchange will exploit the other side. It will risk initiating an arrangement of co-operation to the cut-throat. If there is a sufficiently high profit in the supply chain, each actor will seek...
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For the innovative industrial cluster – i.e. one which is not geographically
defined in a region – the interaction will require supplementation, by
electronic means, through video-conferencing, electronic mail, distance
learning of a more informal kind and so on, as well as, perhaps, less
frequent meetings for working parties, fora and the like. Moreover, it may
require establishment as a ‘network of networks’ whereby some local
associationalism may occur if there is a critical mass of cluster members
in a particular city or locality. Either way – industrial or regional – the
cluster requires, not managers as such, but animateurs or facilitators.
Members, especially firms, must take ownership by having a stake in the
network. Responsibility must be taken and rotated amongst member
interests to ensure continuity of meetings, information flow,
learning-by-interacting, and so on. Some modest subscription system
needs to be built-in to such arrangements to provide a secretariat. These
are the essentials of ‘economies of association.’

Beyond these housekeeping details, there are, finally, two further matters
of theoretical relevance which it would be remiss not to discuss. The first
is the question of trust in network and systems arrangements; the second
concerns the mechanisms by which institutional and firm learning gains
are made.

5. TRUST AND MICRO-CONSTITUTIONAL REGULATION

In hierarchies, authority flows from the top down. In markets, transactions
are authorised by exchange of resources or contracts. Relationships are
governed purely by utility-maximisation. In heterarchies (networks),
neither of these categories of influence dominates. Rather, networks and
other heterarchic and systems arrangements rely upon trust in
relationships. In pondering the issue of trust, Sabel (1992; 1993) has
usefully introduced the notion of ‘studied trust’. That is, instead of just
assuming trust to be an instinctive, difficult-to-analyse phenomenon, we
need to think about it and systematically analyse why it works, why it
breaks down and how to learn to make it work better. Studied trust is, as
it were, the product of systematising that analysis. Research in this field
is in its infancy, though Fukuyama (1995) has begun to explore it in a
general way.

Sabel’s (1992) case is that trust is the mutual confidence that no party to
an exchange will exploit the other’s vulnerability. If trust is absent, no-one
will risk initiating an arrangement and everyone will sacrifice the gains
of co-operation to the cut-throat or conservative pursuit of self-interest.
If there is a sufficiently high probability of a breach of trust in, say, a
supply chain, each actor will seek to cease trading at the last-but-one point
before breakdown point. Self-interest is furthered by withdrawing from exchanges, even those that are trustworthy. In more recent work, Sabel (1993) detaches his analysis of trust from its apparent correlate, self-interest, arguing that trust is demonstrably a prudent course of action because it integrates actors into a society which, in itself, is a preferable human condition to a Robinson Crusoe-like isolationism. Pushing this further, Ostrom (1992), Putnam (1993) and Sabel (1993) explore the ‘constitutional order’ (Sabel) or ‘micro-constitutional regulation’ (Ostrom) by which holonic ‘social capital’ (Putnam) is successfully deployed. Heterarchies or networks develop ‘constitutions’ or rules and routines of the game by which members regulate themselves and each other. We saw how these operate, mostly beneficially, but sometimes pathologically, in industrial districts. Breaches of trust betray micro-constitutional regulation mechanisms, destroying the constitutional order and devaluing the social capital of the network.

In such circumstances, the positive learning disposition of network members deflates into merely defensive learning of the ‘once bitten, twice shy’ variety. Sabel suggests there are only two ways to get back on track: one, if the gains from risking a breach of trust outweigh the losses; and two, where social capital of a cultural, community, ethnicity or religious kind produces sanctions great enough to prevent a breach in the first place, or supplies a strong enough basis for the breach to be repaired.

Where trust is not breached, where the network is confident and forward looking, institutional learning, by-doing, by-using, by-searching, by-exploring, by-interacting, by-learning itself, can thrive. In Johnson’s (1994) interesting formulation, interactive learning (embodying most of the types of learning, e.g. by-doing, by-using etc.) results in two processes; one, of augmenting an individual, firm or institutional stock of knowledge; two, causing the forgetting of redundant knowledge. The convergence of new and existing knowledge, in the form of innovative ideas and projects, leads, after an institutional selection process, to innovation, whether of product or process.

6. CONCLUDING REMARKS

We are now in a position to distinguish between industrial districts, networks and clusters:

- Industrial districts tend to be mono-industrial, SME-dominated, highly localised production systems in which firms interact through dense networks of sub-contracting and with a highly differentiated division of labour. Enterprise support organisations can be located inside the industrial district;

- Networks are more-or-less agreements amongst firms product or product-range, equipment and computer agreements and firms will Networks may be geograph

- Clusters are voluntary arra through markets, networks in their general business pr assets, probably some sect common vision of what th often regional in scale.

This has been a rather wide-rang thinking and empirically-based weaknesses of the idea of collab juxtaposition to the idea of compe case has been made that both, vari nowadays, in an increasingly po consideration of the ways of a collaboration has come to the fore.

Evolutionary economic theory, constitutional theory cluster theory are key bases for analysing comp highlighting the important role and of heterarchic or network forms partnership is, not infrequently, a economies which are also relatively Ireland, in this respect, has scant gi partnership down from the comin business of economic activity.

In the succeeding chapters, a numbe of networked inter-firm, inter-agent integrative governance structures an concrete detail. These case-reviews the Irish situation to make a prelimin readiness and receptiveness to pursu
Networks are more-or-less formalised, possibly contractual, agreements amongst firms to engage in joint production of a given product or product-range. Reciprocity and exchange of skills, equipment and competencies can be the subject of network agreements and firms will share an agreed business objective. Networks may be geographically circumscribed but need not be;

Clusters are voluntary arrangements in which firms may operate through markets, networks and aspects of hierarchy to assist them in their general business process. Firms will have complementary assets, probably some sectoral identity and are likely to share a common vision of what they are trying to achieve. Clusters are often regional in scale.

This has been a rather wide-ranging, but necessary, survey of recent thinking and empirically-based reflection on the strengths and weaknesses of the idea of collaboration as a competitive weapon in juxtaposition to the idea of competition as a competitive weapon. The case has been made that both, variably, come into play all the time but nowadays, in an increasingly post-Fordist era, the need for serious consideration of the ways of securing the basis for constructive collaboration has come to the fore.

Evolutionary economic theory, industrial district theory, micro-constitutional theory cluster theory and the theory of interactive learning are key bases for analysing competitive advantage. They converge in highlighting the important role and function, but also occasional pitfalls, of heterarchic or network forms of economic co-ordination. Social partnership is, not infrequently, an over-arching feature of political economies which are also relatively heterarchic in their business affairs. Ireland, in this respect, has scant grounds to fear the notion of pushing partnership down from the commanding heights to the day-to-day business of economic activity.

In the succeeding chapters, a number of national and regional instances of networked inter-firm, inter-agency system relationships and systems integrative governance structures and policy-actions will be explored in concrete detail. These case-reviews will be a prelude to referral back to the Irish situation to make a preliminary assessment of the country’s likely readiness and receptiveness to pursue such a path.
1. INTRODUCTION

Emilia-Romagna has acted as a development organisation through difficult to identify: measured in Europe, it has had an unemployment compared to Italy’s 11 per cent; an of Europe’s highest per capita GDP this in a region which is dominated located polycentrically in industrial specialisation (Carpi for knitwear shoes, etc.) is the norm. Emilia-F surviving anachronism, but of a dy: co-ordination in which co-operati (Del Ottati, 1994).

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<td>Emili</td>
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<td>Population (1991)</td>
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<td>GDP per capita (1991; in per cent of EU average)</td>
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<td>Unemployment rate (1993)</td>
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Source: Eurostat.
CHAPTER 2

EMILIA-ROMAGNA, INDUSTRIAL DISTRICTS AND THE LIMITS OF DOWNSTREAM INNOVATION

1. INTRODUCTION

Emilia-Romagna has acted as a tutor to local and regional economic development organisations throughout the world. The reasons are not difficult to identify: measured in per capita income it ranks eighth in Europe, it has had an unemployment level consistently below 5 per cent compared to Italy’s 11 per cent; and the regional economy recorded one of Europe’s highest per capita GDP rates to the 1990s (see Table 2.1). All this in a region which is dominated by small firms (some 310,000 in all) located polycentrically in industrial districts where mono-industrial specialisation (Carpi for knitwear, Bologna for machinery, Forli for shoes, etc.) is the norm. Emilia-Romagna has the character, not of a surviving anachronism, but of a dynamic pointer to a future of industrial co-ordination in which co-operation results in competitive advantage (Dei Ottati, 1994).

<table>
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<td>Emilia-Romagna Economic Indicators</td>
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<th>Emilia-Romagna</th>
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<tr>
<td>Population (1991)</td>
<td>3.9 million</td>
<td>344.8 million</td>
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<tr>
<td>Labour Force Participation Rate (1991)</td>
<td>53.2% (women: 41.9%)</td>
<td>55.1% (women: 43.4%)</td>
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<tr>
<td>Labour force (1991)</td>
<td>1.8 million</td>
<td>142.0 million</td>
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<tr>
<td>Employment in Agriculture</td>
<td>8.6%</td>
<td>6.4%</td>
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<tr>
<td>Industry</td>
<td>35.1%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Services</td>
<td>56.3%</td>
<td>60.3%</td>
</tr>
<tr>
<td>GDP per capita (1991; in per cent of EU average)</td>
<td>129%</td>
<td>100%</td>
</tr>
<tr>
<td>Unemployment rate (1993)</td>
<td>4.7% (women: 7.3%)</td>
<td>10.4% (women: 12.2%)</td>
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Source: Eurostat.
However, recent developments in the districts have led to a reappraisal of the model of localised sub-contracting and so-called 'flexible specialisation' (Piore & Sabel, 1984) not least because of innovation deficits in the district approach to production and competition. Because of the craftsman and artisan traditions in the districts, problems have usually been solved locally and internally to the district. Later it will be shown how, in the Carpi knitwear district, innovation was controlled locally and successfully though not without outside assistance. But, in general, such solutions are good examples of what may be called 'downstream' innovation. By downstream innovation is meant the kind of thinking which, in a different field, produces 'end-of-pipe' solutions to pollution problems. This occurs when pollution scrubbers are fixed to, for example, power-station chimney stacks to reduce sulphur emissions.

An 'upstream' innovation would be one that resulted in a systemic redesign of power-generating technology to reduce emissions before they arrived at the end-of-pipe. Upstream innovation strongly implies advanced scientific and technological knowledge of the kind not normally found in industrial districts. Rather it resides in universities, specialist research institutes and the R&D laboratories of large companies or specialist consultancies. Emilia-Romagna is at the stage where its traditional downstream problem-solving approach, which has enabled its firms to renew their competitive edge many times, may have reached its limits.

2. EMILIA-ROMAGNA: UPGRAADING THE DISTRICTS

Emilia-Romagna can be seen to have passed through three stages of development towards its present economic situation. This has been summarised by Brusco (1990) as the passage from a Mark 1 Marshallian (1919) industrial district model based on organic inter-firm linkages and associated 'industrial atmosphere', or cultural identity capable of transformation into collective enterprise, to a Mark 2 stage in the 1980s. In the Mark 2 stage, what had hitherto been unreflective social norms of behaviour became embodied in the 'real service' centres. These were local in origin but funded by the regional government and organised collectively. Where innovation was in demand, this was met by networking with sympathetic Italian national research institutes. Now, a third phase has been reached, because this successful system of 'real service' provision is no longer sufficient to meet the threat of competition in the 1990s.

In a different, but related analysis, Patrizio Bianchi and his NOMISMA (a Bologna political economy research institute) collaborators (e.g. Bianchi & Giordani, 1993) anatomised the development of the Emilian industrial districts in the following way:

(i) Phase 1

This begins in the 1960s and Emilia-Romagna, like many nort firms providing basic products for agricultural machinery and re side with the large agricultural and small firms were artisan firms, offi by artisan’s associations such as Artisans) or CNA (the National Co large firms inside, but mostly buffer-suppliers due to increasing the machinery industry were target quantitative instability. In textiles, main textile industrial district, had...
ricts have led to a reappraisal ting and so-called ‘flexible t least because of innovation ion and competition. Because the districts, problems have to the district. Later it will be, innovation was controlled but outside assistance. But, in

des of what may be called innovation is meant the kind reduces ‘end-of-pipe’ solutions pollution scrubbers are fixed to, to reduce sulphur emissions, that resulted in a systemic reduce emissions before they innovation strongly implies

ded the kind not normally descis in universities, specialistories of large companies or is at the stage where its approach, which has enabled its y times, may have reached its

UNG THE DISTRICTS

ressed through three stages of dic situation. This has been from a Mark I Marshallian ganic inter-firm linkages and cultural identity capable of a Mark 2 stage in the 1980s. unrelective social norms of service’ centres. These were l government and organised demand, this was met by al research institutes. Now, a successful system of ‘real neet the threat of competition

Bianchi and his NOMISMA nstitute) collaborators (e.g. development of the Emilian

(i) Phase 1

This begins in the 1960s and lasts up to the end of the 1970s. Emilia-Romagna, like many northern Italian regions, had many small firms providing basic products for a local market. A case in point would be agricultural machinery and repairs which had long-existing side-by-side with the large agricultural and foodstuffs industries. Many of these small firms were artisan firms, officially classified as such and represented by artisan’s associations such as GCA (General Confederation of Artisans) or CNA (the National Confederation of Artisans). In the 1960s, large firms inside, but mostly outside the region, were seeking buffer-suppliers due to increasing variations in demand. Artisan firms in the machinery industry were targeted by such firms seeking to deal with quantitative instability. In textiles, the trajectory was different. Carpi, the main textile industrial district, had been a centre for straw hat making. When the industry collapsed in the 1940s, agricultural homeworking – the main source of production – dried up. However, artisans used their contacts with large firms to begin selling (not making) cheap clothing. Later, some began producing T-shirts, using the homeworking tradition in the area. Later, as agricultural work declined, more labour was taken on in small and medium firms expanding into factory production. Large firms, often directly or indirectly, influenced the course followed by small and medium enterprises (SMEs) in this phase.

(ii) Phase 2

By the end of the 1970s and into the 1980s, the SMEs that had become established as sub-contractors or independent producers began to show flexibility in both the quantity and, importantly, the quality of their output. This coincided with a major crisis in the early 1980s in which large firms experienced a severe decline in demand for their products. This recession signified something of a change in the nature of markets for final consumer goods. It marked the ending of the era when fundamentally standardised, mass-produced goods of average quality could easily be sold on mass-markets. For one thing, less developed countries were forced by the debt-crisis induced by the anti-inflationary interest-rate hikes of Western governments to engage in export-drives. These were often of such a scale, rapidity and intensity that, for clothing in particular, they posed real problems for both mass-producers and SMEs. For the latter, they posed the problem of very rapid emulation of fairly downmarket products, forcing a more up-market posture on the part of those industrial district firms in direct competition. Many larger firms also vacated markets to cheap imports where they could no longer compete. The SMEs responded faster and more flexibly to the demand
crisis. Large multinationals were not in a position to erect barriers to SME entry. The small-firm sector had gained an advantage which larger firms could neither match nor prevent.

(iii) Phase 3

The third phase of development in the Emilian SME sector has occurred since the beginning of the 1990s. It is the most difficult period faced by the firms of the industrial districts, provoked in part by the reactions of large firms to the success of the SMEs in the 1980s. But this crisis is also a product of the emerging single European market and trends towards globalisation of production more generally.

Faced by heightened global competition, large firms have responded in ways comparable to those of the SMEs a decade earlier. They have engaged in more intensive product and process innovation and have developed more flexibility in their management of the product cycle. Instead of producing for the mass-market, they have focused upon more rapid turnaround in more diversified and quality-conscious markets. An innovation of particular importance has been the move by large firms in the machinery, garments and food-processing industries to control distribution networks. This is consistent with one of the effects of economic integration and the globalisation of production, namely the necessity to gain access to the markets of competitor firms. Not infrequently, this is achieved by the formation of complementary strategic alliances or joint ventures with other large companies. Small and medium-sized enterprises find this form of competition difficult to deal with. Fundamentally, they tend to be price and product-takers or followers. They react to the innovations of others. When the price and product leaders ‘leave the room’ as it were, this works. But if, as may now be the case, leaders are seeking to introduce oligopolistic rule, especially through the control of distribution chains, it is a less viable strategy. The issue for SMEs is whether they can reorganise to become innovators, if so which form is most appropriate given that there has to be a high degree of collaborative effort, and what is the best role for regional and local government institutions in assisting SME innovation.

3. THE ERVET SYSTEM

At the heart of the region’s institutional apparatus lies ERVET (Ente Regionale per la Valorizzazione Economica del Territorio), the regional development agency established in 1974. One of the distinctive features is that ERVET has a shareholding structure which positively integrates the potential of the public and private sectors, of credit and financial institutions, entrepreneurial associations, research services’ (servizi reali), which are the wider support network, the core of the system. Real services are to be (grants, loans, tax relief etc.) activities, e.g. R&D, market research, control and professional training, which generate structural, rather than organisational change. The c from two factors. First, the regiona and therefore it is not able to this attempt to make a virtue of necessity, the provision of real services has more than the provision of finance. Alt free of charge, the fees are set below the rate of the private consultancy.

The services and activities in which the three categories:

- **Sectoral Projects:** This c analysis and strategic rese region’s economy. By and l of what projects will be ne helping to implement t entrepreneurial forces’ (Bi sectoral level, there tends to business service centres, ma which means that they have a of the problems of the sector.

- **Horizontal Projects:** The n are targeted on the environm control, i.e. activities that ha regional economy. On the E is responsible for forging alli like-minded regions in the technology transfer and joint programmes. As regards c enormous significance to its t to train employers and employ management.

- **Territorial Projects:** The a growth-sustaining environme
osition to erect barriers to SME advantage which larger firms

ilian SME sector has occurred most difficult period faced by ked in part by the reactions of he 1980s. But this crisis is also an market and trends towards y.

large firms have responded in a decade earlier. They have process innovation and have gement of the product cycle, they have focused upon more quality-conscious markets. An en the move by large firms in ccessing industries to control t with one of the effects of on of production, namely the ts of competitor firms. Not on of complementary strategic large companies. Small and f competition difficult to deal price and product-takers or of others. When the price and this works. But if, as may now e oligopolistic rule, especially it is a less viable strategy. The nise to become innovators, if it there has to be a high degree st role for regional and local innovation.

apparatus lies ERVET (Ente a del Territorio), the regional one of the distinctive features which positively integrates tors, of credit and financial institutions, entrepreneurial associations and chambers of commerce. ERVET places great emphasis on the provision of what it calls 'real services' (servizi reali), which are either provided directly or through its wider support network, the core of which is the business service centre system. Real services are to be distinguished from financial services (grants, loans, tax relief etc.) and they cover a wide array of different activities, e.g. R&D, market research, technical consultancy, quality control and professional training etc. Real services are defined as those which generate structural, rather than temporary, changes in the organisation of a company. The emphasis placed on real services stems from two factors. First, the regional government has a very limited budget and therefore it is not able to dispense financial grants. Second, in an attempt to make a virtue of necessity, the regional authorities believe that the provision of real services has a more innovative impact on the firm than the provision of finance. Although real services are not dispensed free of charge, the fees are set below the prevailing market rate, i.e. below the rate of the private consultancy sector.

The services and activities in which ERVET is directly engaged fall into three categories:

- **Sectoral Projects**: This category of services covers sectoral analysis and strategic research for all the main sectors of the region's economy. By and large, this means taking an overview of what projects will be needed in the medium term and then helping to implement them 'in co-operation with the entrepreneurial forces' (Bianchi & Giordani, 1993). At this sectoral level, there tends to be a division of labour with the business service centres, many of which are sectorally oriented, which means that they have a much more intimate understanding of the problems of the sector;

- **Horizontal Projects**: The main lines of action in this category are targeted on the environment, European integration and quality control, i.e. activities that have an impact across all sectors of the regional economy. On the European front, for example, ERVET is responsible for forging alliances between Emilia-Romagna and like-minded regions in the EC, the aim being to promote technology transfer and joint-ventures to exploit the EC's R&D programmes. As regards quality control, ERVET attaches enormous significance to its Quality Project, which is designed to train employers and employees in the techniques of total quality management;

- **Territorial Projects**: The aim of these actions is to create a growth-sustaining environment by rehabilitating derelict land and
buildings, on the one hand, and on the other, to balance territorial needs and resources. Of growing importance here is ERVET’s goal of creating a pollution-free environment.

In addition to ERVET, a crucial part of the regional innovation support function is played by the business service centres, all of which are shown in Table 2.2. These centres are of two types: (1) sectorally-focused centres, which are geared to the specific requirements of a particular sector and (2) regional centres, which are geared to economy-wide activities, like technology transfer (Aster), sub-contracting (Resfor) and export promotion (Ase). Each of these centres is financially supported by ERVET as well as by other public and private bodies, e.g. local authorities, chambers of commerce and trade associations etc. In order to involve these wider ‘entrepreneurial forces’, most of the centres seek to enlist them as shareholders and as members of the governing board. This strategy is not simply motivated by financial considerations.

Quite apart from their valuable feedback role, these organisations also help to establish the commercial credibility of the centres, without which it is impossible to build high-trust relationships with the private sector.

4. CITER AND CITERA: DOWNSTREAM INNOVATION IN THE KNITWEAR INDUSTRY

Based in Carpi, a few miles north of Bologna, CITER is the business service centre dedicated to the textile and clothing industry. Created in 1980, this centre originated as a professional training initiative which began in 1976, funded by the European Social Fund. The initial sponsors of this ‘real services’ centre were ERVET, the Emilia-Romagna development agency, the municipality of Carpi and a number of trade associations. By the early 1990s, CITER had 20 full-time staff. At the beginning it was funded wholly by public sector resources, but by 1990, some 70 per cent of total income (£1.5 million) was generated from services rendered and fees from its 760 member firms.

On the technology front, one of the most interesting innovations undertaken by CITER in recent years is the Citera workstation for creative design, a computer aided design (CAD) system developed in co-operation with ENEA (the Italian National Energy Research Institute). CITER believes that local firms need to utilise CAD to a much greater extent than hitherto because of the ever-growing pressure to abbreviate ‘time to market’ cycles in the clothing industry. The Citera workstation is thus a good test of CITER’s ability to educate the industry into moving towards a new and more sophisticated technological trajectory. Let us consider
somina, CITER is the business incubation system at the Foundation Institute. The initial sponsored by the EU’s “Emilia-Romagna” project, it was a relatively high-cost project, but it generated an extensive amount of information, research, and development in the region. The centres provide a range of services, including business training, incubation support, and technological development. However, the centres are not without their challenges, as many of them struggle to attract sufficient funding. The centres also face competition from other similar initiatives in the region.

**Table 2.2: Business Service Centres in Emilia-Romagna**

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>User Category</th>
<th>Services Offered</th>
<th>Year of Establishment</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agencia Polo Ceramico</td>
<td>Faenza</td>
<td>Ceramics</td>
<td>Information, research</td>
<td>1988</td>
<td>1</td>
</tr>
<tr>
<td>ASE</td>
<td>Ravenna</td>
<td>All sectors</td>
<td>Promotion</td>
<td>1986</td>
<td>2</td>
</tr>
<tr>
<td>ASTER</td>
<td>Bologna</td>
<td>All sectors</td>
<td>Documentation, databank access, planning</td>
<td>1985</td>
<td>11</td>
</tr>
<tr>
<td>CEMOTER</td>
<td>Ferrara</td>
<td>Earth removal machines</td>
<td>Certification, research</td>
<td>1982</td>
<td>13</td>
</tr>
<tr>
<td>Centro Ceramico</td>
<td>Bologna</td>
<td>Ceramics</td>
<td>Experimentation, testing, research, training</td>
<td>1976</td>
<td>31</td>
</tr>
<tr>
<td>CERCAI</td>
<td>Forli</td>
<td>Shoes</td>
<td>Fashion trends, training</td>
<td>1983</td>
<td>3</td>
</tr>
<tr>
<td>CERMET</td>
<td>Bologna</td>
<td>Metals</td>
<td>Documentation, analysis, technological consulting</td>
<td>1983</td>
<td>3</td>
</tr>
<tr>
<td>CESMA</td>
<td>Reggio Emilia</td>
<td>Agricultural machinery</td>
<td>Studies and research</td>
<td>1983</td>
<td>4</td>
</tr>
<tr>
<td>CITER</td>
<td>Modena</td>
<td>Textiles, clothing</td>
<td>Fashion trends, information, research</td>
<td>1980</td>
<td>17</td>
</tr>
<tr>
<td>QUASCO</td>
<td>Bologna</td>
<td>Construction</td>
<td>Information, research, training</td>
<td>1985</td>
<td>11</td>
</tr>
<tr>
<td>RESFOR</td>
<td>Parma</td>
<td>Mechanics sub-contracts</td>
<td>Information, promotion</td>
<td>1986</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: ERVET
the potential benefits of Citera in more detail. To understand the significance of CAD, we have to appreciate the nature of the local industry into which it is beginning to diffuse. According to CITER some 11,136 clothing and knitwear firms operate within the region of Emilia-Romagna, 2,600 of which are located in Carpi itself. Of the Carpi total some 1,850 operate solely as sub-contractors, each performing a small part in the production chain, e.g. knitting fabric, overlocking or button-holing. The remaining 750 are in direct contact with the retail market and these firms are typically involved in a much wider array of operations, e.g. design, marketing, grading, pattern-making, packaging and dispatch. Cutting and making-up are sub-contracted within their own network of specialised small firms.

In markets characterised by very small order sizes (typically less than 1,000 garments) companies require several hundred styles for a given season. Companies involved in *pronto moda* (i.e. quick fashion) experience an even more dramatic turnover of styles. This can represent a high cost to the company. (In the UK context, for example, the International Wool Secretariat has estimated that each sample design costs £2,500 to produce in designers’ time, machinists’ wages, materials and overheads). CAD facilities can lead to faster production of new styles and samples, with significant cost savings, especially in terms of designers’ time. In addition to cost savings, CAD enhances responsiveness to market trends and retailers’ demands. Through CAD a company can boost its position in the market by offering retail buyers a shorter lead time into the production of new styles. Furthermore, CAD enables a company to produce the same basic garment with a much wider range of variants. Many companies perceive CAD to be a key part of any strategy to move into higher value production based on versatile responses to market trends.

Of the 760 members of CITER, 120 make use of the Citera system. To date 90 of these firms have purchased the system outright, and the remainder use it on a bureau basis. The initial minimum outlay for the purchase of Citera is roughly £40,000. However, the total cost, including training of existing staff, maintenance etc., is said to be in the region of twice this figure. The initial cost also includes access to a ‘club’ of users who meet regularly to discuss the development of the system with engineering and software specialists from CITER. The content of Citera disks is updated every 3-4 months and the design of the software is updated at least every 12 months. Follow-up services form an integral part of the Citera package, and these services were perceived to be excellent by all the companies interviewed (including the one non-user).

(i) Evaluating Citera: How Do They Use It?

To gain a first-hand assessment of Citera’s quality, four users and firms which were in direct contact with it were interviewed (four users and firms which were in direct contact with it). To what extent does Citera meet the needs of local firms? Before answering this question, it is important to understand the initial concept through to the realization of the finished product.

The interviews suggested that the Citera system offers the following benefits:

1. **Enhanced Flexibility**: The system allows for easy modifications to designs, which can be critical in a fast-paced market where trends change rapidly.
2. **Improved Efficiency**: CAD reduces the time required for design and production, allowing for quicker production cycles.
3. **Cost Savings**: By reducing the need for physical samples and prototypes, Citera can save companies money.
4. **Enhanced Design**: CAD allows for more intricate design possibilities, which can appeal to a wider customer base.
5. **Quality Control**: The system ensures that designs are accurately transferred to production, reducing errors and waste.

Significantly, all the interviewees found the benefits of Citera with the following improvements in versatility or quality. They also noted that the system allows for the rapid production of prototypes, which can be a key factor in gaining a competitive edge in the market.

Each of the five companies surveyed with Citera, linked to the concentration...
detail. To understand the nature of the local industry, Jeuring interviewed 11,136 people within the region of J in Carpi itself. Of the Carpi contractors, each performing a varying array of tasks from cutting fabric, overlocking or direct contact with the retail market, it was found the region of 1 within the Carpi itself. Of the Carpi contractors, each performing a variety of tasks from cutting fabric, overlocking or direct contact with the retail market, it was found that each sample design required different machine skills, especially in terms of production costs, CAD enhances the demand. Through CAD at the design stage, many firms buy-in design from external studios, using Citera to ‘realise’ these images by translating them into precise cuts of fabric or knitting patterns. The system allows this process to be undertaken with great accuracy, both in relation to colour and to the detail of garment construction. Sub-contractors are thus working to a much clearer set of instructions.

Significantly, all the interviewees were adamant that they would not share the benefits of Citera with sub-contractors even if this led to improvements in versatility or quality. Although Citera is capable of producing disks which can be read by programmable knitting machines of the type used by many sub-contractors, companies would not allow this to happen because they feared that they might be giving too much away to potential competitors. Citera was seen as giving its users a position of power within the chain of production – providing them with the information that allowed them to be network leaders. Nevertheless, such information flowed informally, even though firms that had invested in Citera were perceived to be excluding the one non-user.

Each of the five companies surveyed identified a common set of problems with Citera, linked to the concentration of expertise in the hands of one
or two highly trained operatives. These misgivings may be influenced by two ‘cultural’ elements of the Emilian economy:

- Firstly, it may be argued that the ability of the owner-manager (who is likely to have been trained on the shop floor) to oversee the entire production process in a more or less interventionist and hierarchical way is central to the Emilian tradition;

- Secondly, the existence of a shared technical discourse across the industry is central to its integration and to the co-ordination of a very decentralised system of production.

Both of these elements are threatened by the creation of a specialised technical realm which works against traditional and seemingly common sense patterns of co-operation, especially in a sphere so crucial to the competitiveness of firms. That the majority of trained operators – from which Citera technicians are drawn – are female adds a gender dimension to the cultural barriers to adopting the new practices.

How should CITER’s role in diffusing the Citera system be assessed? What is clear is that Citera tends to be confined to the larger companies, mainly on account of the capital outlay involved. Firms operating Citera seem to doubt its ability to justify itself in financial terms alone, and this is compounded by the fact that the system is rarely used to its full capacity. Its advantage clearly lies in its ability to aid longer term diversification into high value markets, rather than because it can produce immediate returns on investment. In this sense, CITER has achieved a notable success in the promotion of Citera.

Each Citera user surveyed linked its decision to adopt the system to its existing membership of CITER and to a high degree of satisfaction with CITER service generally. CITER kept them abreast of products and technological developments on a regular basis, and Citera was presented as a logical progression of their involvement with the centre and its services. In other words, the interviewees subscribed to the view that innovation can be disseminated most effectively through existing networks which have been tried and tested. CITER’s creation of a local forum, in which local industrialists can meet on a regular basis, was thought to be central to the trust and co-operation on which the dissemination of Citera has depended.

(ii) The Firms in Context

To gain a more precise evaluation of Citera and the utility of CITER more generally, let us look at each of the firms in our panel.

Severa

Severa was formed in 1935 and 1980, because the bulk of produc
ing line with the pattern adopted main product lines are men’s, w
which is destined for the Italia
pronto moda (mainly for the h
around half of which was expor

Only samples are cut or made
sub-contracted to an average of
sub-contractors are located m
increasing number are loc
sub-contracting outside the reg
quality and reliability of delivery
of what constitutes an ‘average’
been falling in size in recent y
lead times for follow-up orders
electronic point of sales (EPOS) t
of fast changing consumer trends

Citera is used to interpret designs
and plays no part in the initia
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evolved. Firms operating Citera
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rarely used to its full capacity.
aid longer term diversification
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ITER has achieved a notable

Citera is used to interpret designs commissioned from an external studio
and plays no part in the initial creative process. One of the main
advantages of the Citera system was that it offered significantly reduced
cycle times in the preparation of new ranges. Furthermore, great
advantages in terms of accuracy of detail and colour were also reported,
very important in helping the company to move into higher value seasonal
export markets. Citera’s ability to create high quality images also played
a major role in the company’s marketing presentations. Cost savings,
however, had not been calculated, though some gains were said to have
been achieved in terms of production costs and stock levels. Above all,
the company cited the greater responsiveness and ability to plan
production which resulted from the use of Citera.

The main problems identified with Citera focused on cultural resistance:
indeed, the factory manager clearly hated the system even though he
recognised the benefits which accrued. Company managers in general felt
that the system concentrated expertise in the hands of two technicians
(design and software specialists) trained to operate it – both of whom were
young women. The company (a relatively large enterprise by Carpi
standards) also questioned whether the initial outlay was justified in terms
of the extent to which Citera is utilised on a day-to-day basis.

CITER’s role in informing the company’s decision to adopt CAD was
considered helpful, but not a determining factor. Independent consultants
were also used to assess the benefit to the company. It was also felt that CITER’s ability to offer impartial advice might be compromised by its marketing of Citera. The follow-up support on Citera was considered to be excellent, especially in relation to software improvements. Training of staff on Citera was also of a high quality, ‘though not specifically targeted to our needs’. Day-to-day problem solving with Citera would be undertaken by internal specialists, though CITER was at hand if needed.

Other CITER services were also used, in particular the Fashion Forecasting service, which was considered excellent. The company had a somewhat negative attitude to the training services offered by CITER and other providers, which were ‘always too costly’. As regards technology transfer to its sub-contractors, the company emphatically refused to allow the latter to programme machines directly from Citera, and indeed refused to let them have access to Citera in any way at all. Managers felt that Citera offered the company a considerable advantage in terms of ‘network leadership’ and they did not want to lose this position by sharing information. In part they also feared the pirating of designs by their sub-contractors. The Severa case study suggests that information does not travel as freely between firms as the theorists of the ‘Emilian’ model have argued. In other words, proprietary attitudes constitute an important barrier to the diffusion of new technology.

**Carma**

Carma was founded in 1960 and it employs 110, down from 600 in 1975, because the bulk of production operations has been farmed out to sub-contractors. Some 80 per cent of its output consisted of women’s knitwear, the remaining 20 per cent made up of men’s knitwear. Approximately 50 per cent of output was manufactured on a seasonal basis, the other half was *pronto moda*. In terms of value, the proportion of *pronto moda* production has fallen in recent years because seasonal ranges have become more up-market. As with Severa, only samples are cut or made up internally, since production was sub-contracted to a group of 12 firms, all of which were located in Veneto, Puglia or Calabria, because these areas had lower wage cost advantages over Emilia-Romagna. However, new sub-contractors were being sought in Slovenia and Greece, in part because the company was under considerable pressure from retailers to cut prices. Local homeworkers were used on occasion, but as little as possible because of problems with quality and reliability. Average production runs varied in size (circa 100-1000 garments) depending on the style, but the size of orders in some segments of the market was increasing due to a gradual process of retail concentration and the growth of sales through supermarket chains. Lead times were decreasing in export markets both *pronto moda* and season.

Citera was only used for the France. Citera offered the con the range of styles and the col for the production of new sty played only a small part in this increasingly important marketi as a substitute for the produc buyers with whom an establish as a key tool in the company’. resistance was cited as a proble use had provoked new confl manag manag relinquish ‘hands-on’ control of to the young women trained to o also concerned that the rate of uti outlay on the system.

The company sought advice from Citera, and seemed keen to str independently of CITER. But its important influence in the decisio ‘joining the club’ of local innova CITER were considered excelle solving and implementation. CI technician to use the system. The n to be ‘satisfactory’, while the sty CITER Fashion Forecasting serv though its production advice was company expressed the view that C firms, though the likely benefi w for sharing the Citera system with ‘definitely not’, for the same reaso

**Finmoda**

Finmoda was founded in 1975 and are men and women’s knitwear, 55 EC countries. All production is Samples were manufactured intern routed through a complex network o were located mainly though not
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chains. Lead times were
decreasing in export markets (especially in Germany and Holland) for
both pronto moda and seasonal ranges.
Citera was only used for the 'realisation' of designs from a studio in
France. Citera offered the company much greater versatility in terms of
the range of styles and the colours and patterns of each style. Cycle times
for the production of new styles have been shortened, but Citera has
played only a small part in this process. However, Citera was playing an
increasingly important marketing role, with high quality images available
as a substitute for the production of samples (at least in the case of retail
buyers with whom an established relationship existed). Citera was seen
as a key tool in the company's strategy of moving upmarket. Cultural
resistance was cited as a problem with the introduction of Citera, and its
use had provoked new conflicts between designers and production
managers. The owner-manager appeared particularly unwilling to
relinquish 'hands-on' control of this key area of the production process
to the young women trained to operate the Citera system. Managers were
also concerned that the rate of utilisation did not justify the heavy financial
outlay on the system.

The company sought advice from a wide array of sources before adopting
Citera, and seemed keen to stress that it had made its own decision
independently of CITER. But its membership of CITER was clearly an
important influence in the decision to adopt the system; the company was
'joining the club' of local innovators. The follow-up services offered by
CITER were considered excellent, particularly in terms of problem
solving and implementation. CITER had also trained a stylist and a
technician to use the system. The manager considered the level of training
to be 'satisfactory', while the stylist herself thought it was 'excellent'.
CITER Fashion Forecasting service was also thought to be excellent,
though its production advice was said to be of limited relevance. The
company expressed the view that CITER staff should spend more time in
firms, though the likely benefits were not specified. As to the prospects
for sharing the Citera system with its sub-contractors, the manager said
'definitely not', for the same reasons given by Severa.

Finmoda

Finmoda was founded in 1975 and it employs 230 people. Its main lines
are men and women's knitwear, 55 per cent of which is exported to other
EC countries. All production is seasonal rather than pronto moda.
Samples were manufactured internally, but final production runs were
routed through a complex network of more than 300 artisan firms, which
were located mainly though not exclusively, in Emilia-Romagna.
Average production runs were in the range of 500-700 garments, but unusually for Carpi firms – occasionally reached 50,000 pieces for German supermarket chains. Order sizes and lead times have not changed significantly over the last three years, partly on account of the absence of *pronto moda* production. Generally, the main problems at Finmoda revolved around the maintenance of quality control between the different stages of sub-contracting, not surprising in view of the number of firms in the network.

Citera was used principally for the ‘realisation’ of design concepts, and its use had led to reduced costs and greater versatility in the production of samples for retail buyers. Citera was also used to enhance the company’s marketing profile because of the high quality of colour printing available. The company was also using the system to create an ‘archive’ of its previous ranges as a means of resourcing a rapid response to future market trends. Resistance to the new technology appeared to be impeding the impact of Citera, and its utilisation was limited by the lack of a full-time operator. The only staff trained to use the system were also responsible for other tasks, and this reflected the ambivalent attitude of managers towards Citera.

The company saw CITER as its principal source of advice on technology, and it considered that the continuous flow of information allowed it to stay abreast of technological change in the industry. This was clearly instrumental in its decision to adopt the system, which the company saw as part of the whole CITER service package. CITER also provided the training and back-up services after the installation of Citera. CITER’s Fashion Forecasting service was also praised, and the company made regular use of CITER’s marketing seminars and related events. In particular, the company cited CITER’s role as a forum for local firms, encouraging the exchange of views and experiences. However, the company was keen to stress the need for a continuing development of software and other services relating to Citera, in part to justify its initial investment. There was also a desire for more ‘specialised, firm-targeted services’, though these were not specified. With respect to technology transfer, the company was very clear that it would not share information with its sub-contractors, for all the reasons given by its fellow adopters.

**Sati-Tesam**

Sati-Tesam was formed in 1957 and it employs 45 people. It manufactures men’s and women’s knitted garments on a seasonal basis exclusively for the Italian market. A separate firm was created in Carpi to produce for the *pronto moda* market, but the other firm. Once again samples production runs were sub-contracted to low-wage regions of Puglia, Veneto greatly in size, but normally fell within the company’s import limits. Resistance to technology was also of Citera, but managers refused this resistance.

CITER was appreciated for its innovation and on new equipment helping the firm to identify in appropriate technology. In addition, assistance in solving day-to-day technical problems was appreciated. CITER was seen as a decision to adopt Citera. And, back-up services were said to be excellent services were also used, but this was by the new ‘who needs to keep herself up-to-date in the commercial strategy, an attitude orientation towards the lower-mid market’.

**Lena Moda**

Lena Moda was formed in 1957 and several hundred in the middle 1970s been farmed out to sub-contractors of outerwear, produced on a seasonal basis exclusively for the *pronto moda* market. The company made in 1970, wish to place orders far in advance of repeat orders at short notice. Unlike this company was wholly respons
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the pronto moda market, but the interviewees had no knowledge of this
other firm. Once again samples were cut or made up internally and
production runs were sub-contracted to 20 artisan firms in the relatively
low wage regions of Puglia, Veneto and Marche. Production runs varied
greatly in size, but normally fell within the 100-1000 garment range. The
company imported a considerable quantity of garments from the Far East,
enabling it to operate in the price-sensitive, low-end of the domestic
market. Citera was only used for the interpretation of design concepts,
but it had already led to cost savings and greater versatility in the
production of samples for retail buyers. This was of considerable
importance given the small size of orders and the large number of styles
required to meet the needs of a considerable range of retail customers.
Resistance to technology was also cited as a barrier to better utilisation
of Citera, but managers refused to be drawn on the details of this
resistance.

CITER was appreciated for its continuous flow of information on
innovation and on new equipment on the market. This was of value in
helping the firm to identify investment priorities and in selecting
appropriate technology. In addition, CITER was able to offer rapid
assistance in solving day-to-day technical problems. This general attitude
of trust towards CITER was clearly very influential in the company’s
decision to adopt Citera. And, following the introduction, CITER’s
back-up services were said to be excellent. CITER’s Fashion Forecasting
service was also used, but this was seen as the preserve of the company’s
stylist ‘who needs to keep herself up-to-date’, rather than as a key element
in the commercial strategy, an attitude which reflected the company’s
orientation towards the lower-middle reaches of the market. Finally, as
to whether the company would diffuse the Citera technology to its
sub-contractors, the answer was emphatically no, again for the same
reasons as before.

Lena Moda

Lena Moda was formed in 1957 and employs 80 people, down from
several hundred in the middle 1970s, because the bulk of production has
been farmed out to sub-contractors. The main product line was women’s
outerwear, produced on a seasonal basis with a third for export. Though
not involved in pronto moda production, the company produced ‘close to
the season’ for middle-market, fashion conscious retailers who do not
wish to place orders far in advance. The company also specialises in
repeat orders at short notice. Unlike most of the other firms in the panel,
this company was wholly responsible for its designs, from concept to
realisation. Apart from sample production, which is undertaken within the firm, orders are sub-contracted to 12-15 reliable small firms, some of which had family connections. Other sub-contractors are located in Abruzzi, where wages are much lower. Production costs will have to be reduced further if the firm is to remain in business because mid-market retailers in Italy were squeezing suppliers' margins. But the scope for savings was restricted by the need to maintain quality. High production costs meant that this company was currently running at a loss.

The company had decided not to adopt Citera for the following reasons:

- The cost was seen as prohibitive, especially given the financial difficulties of the firm, but also because it was unlikely to show an adequate return on investment;
- The owner-manager was not convinced by CITER as to the technical benefits of the system, indeed she saw certain disadvantages. In particular, she was concerned about the concentration of expertise in the hands of operators, and the consequent weakening of her overall control of the production process. In other words, Citera would involve a cultural change in the company (i.e. a more decentralised style of management) which she was unwilling to entertain, even though her technical staff would have welcomed the introduction of Citera.

Although this company had decided against using the Citera system, it was still an active member of CITER, using a wide range of the centre's technical and fashion forecasting services. All of these services were considered worthwhile, not least because they enhanced – and did not devalue – the role of the owner-manager in the production process.

What emerges from this case study is the prevalence of a proprietorial attitude to information, and this constitutes a major barrier to the adoption of new technology. In the case of Lena Moda, this proprietorial attitude is directed towards the internal workforce; in the case of the four adopters it was mainly directed towards the sub-contractors, though even in these cases, loss of managerial control within the firm was a resonant issue. It is difficult to know how CITER – or indeed any other organisation – can be expected to overcome a barrier which is so integral a part of a modern market economy, where information is strength. Nevertheless, it bears repeating that such information gets informally appropriated and diffuses through the system because operators get to know how it works through using it.

(iii) Assessment of CITER and
To a surprisingly large extent, it dynamic and successful regional to all the firms in the panel, adopte factors which seem to explain its
- Its strategic location in Ca clothing district;
- Its ability to attract keen, al by Dr Loredana Ligabi respected director;
- Its capacity to offer useful understandable;
- Its policy of being 'open' clothing industry;
- The involvement of key management of the cer co-ownership – gives CIT essential if firms are to us.

It is not all sweetness and light, ano of the problems which CITER has local firms for any public sector or that CITER is still perceived as a p relationship which it has with the s unable or unwilling to get invc continuing basis.

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(iii) Assessment of CITER and Citera

To a surprisingly large extent, the conventional image of CITER as a dynamic and successful regional technology transfer was corroborated by all the firms in the panel, adopters and non-adopters alike. Among the factors which seem to explain its success are:

- Its strategic location in Carpi, the heart of the region’s textile and clothing district;
- Its ability to attract keen, able and public spirited staff, personified by Dr Loredana Ligabue, CITER’s energetic and highly-respected director;
- Its capacity to offer useful services, the need for which is readily understandable;
- Its policy of being ‘open’ to all the key players in the textile and clothing industry;
- The involvement of key industrial players, in the funding and management of the centre – the very important issue of co-ownership – gives CITER a commercial credibility which is essential if firms are to use its services.

It is not all sweetness and light, and CITER freely concedes as much. Two of the problems which CITER has itself identified are: (1) the distrust of local firms for any public sector role in industrial affairs, which suggests that CITER is still perceived as a public sector agent and (2) the ‘stop-go’ relationship which it has with the smaller firms, many of which are either unable or unwilling to get involved with CITER on a regular and continuing basis.

To these internally-defined problems we could add a number of other problems, two in particular. First, the decision to develop Citera may have altered the way in which CITER is perceived by its clients. Indeed, the Severa company made the point that CITER’s ability to offer impartial advice might be compromised by the marketing of its own Citera product. Second, in common with all the other Emilia-Romagna service centres, CITER serves a dual purpose: in economic terms it was designed to enhance the local productive fabric; in political terms it was designed to promote consensus within the industry. As it begins to offer more sophisticated services – like the Citera workstation – the effect is to create new corporate hierarchies as the take-up of these services is biased towards the more innovative firms. This could well threaten the political consensus within the industry if the smaller firms see CITER as an ‘agent’ of the larger players in the community.
In the longer term, a number of key problems have to be overcome, problems which Emilia-Romagna shares with many neighbouring regions in Northern Italy. Amongst the most pressing problems we might cite the following:

- Italy has lost its long-held comparative price advantage through rises in wages, social security and general production costs in the 1980s, though regained some advantage with the 1992 devaluation;
- Small labour-intensive companies, the backbone of Italy's export performance, have concentrated on consumer sectors in which the newly-industrialised countries have a huge price advantage;
- Small scale family-run firms tend to be ill-equipped to confront the challenge of globalisation, with the increasing need for sophisticated marketing and after-sales services;
- Small companies have traditionally financed exports out of cash flow and, at a time of recession and high interest rates, they lack the financial muscle to cope in this cold business climate;
- Too little attention has been paid by large and small companies alike, to innovating out of mature sectors and into more profitable high technology sectors
- A key problem for the small firm sector in general is the relative absence of flexible financial instruments to finance innovation and growth because risk capital is very under-developed, especially, it seems, in Emilia-Romagna;
- Small firms in all sectors will have to pay more attention to R&D and product innovation in the 1990s because, in the 1980s, they tended to focus on cutting costs and searching for new markets.

These are just some of the problems which threaten to overwhelm the regional economy of Emilia-Romagna, with its high dependence on SMEs in mature sectors. To be fair, however, the regional government is addressing these problems as a matter of urgency and, in CITER, it has an agency which is offering credible and innovative solutions to the dilemmas of a mature industrial sector.

5. OVERVIEW OF EMILIA-ROMAGNA

(i) Responsiveness to the Need for Change

The pressures in Italy, and particularly its leading small firm region of Emilia-Romagna, originate from heightened competitiveness within the European Single Market and glo Industrialising Economies.

At present, therefore, it seems like greater responsibilities by Rome will have to be spent parsimoniously and that the regional government, thrifty and careful. Even before the advent of Dini governments, regional industr Emilia-Romagna, against the judges, the regional government, thrifty and careful. Even before the advent of Dini governments, regional industries in Emilia-Romagna, against the judici that the regional government, thrifty and careful. Even before the advent of Dini governments, regional industries in Emilia-Romagna, against the judges had taken. Innovative business services were argued by the industr Chambers of Commerce in Emilia-Romagna to their services and that such services were not be government set them up is, argues this analysis.

In any case, for a four-year period, the government had wrestled with the industrial policy in ways which sati without undermining the effective, of the small firm business sector ha for competitiveness over the preceding government now had to defend successful, interventions to support newly resurgent business services but had not been capable of providing.

The approach that has now been at business support must be conducive to tendering process. In this way, exes will be likely to retain their fundi sub-optimally and are more likely to los is then conceivably available to fun

Amongst the latter could be project and agreed need for Emilian small innovative. Not least, this is expect small firms to engage in collaborati or research institutes. There university-industry research collaborative 1992 it was constitutionally unique made it possible, but the learning c
European Single Market and global competition from Asian Newly Industrialising Economies.

At present, therefore, it seems likely that the Italian regions will be given greater responsibilities by Rome than they have hitherto enjoyed. But these will have to be tempered by the requirements that budgets will have to be spent parsimoniously and that business should manage business affairs. The Emilia-Romagna government thus has to walk a narrow line most carefully. Even before the advent of the Berlusconi and subsequent Dini governments, regional industrial pressures were building up, in Emilia-Romagna, against the judicious interventionary posture of support that the regional government, through its development agency, ERVET, had taken. Innovative business services centres had been established and these were argued by the industrial association Confindustria and the Chambers of Commerce in Emilia-Romagna to constitute unfair competition to their services and those of private consultants. The fact that such services were not being provided before the regional government set them up is, argues ERVET, conveniently overlooked in this analysis.

In any case, for a four-year period up to Spring 1994, the regional government had wrestled with the question of how to reform its regional industrial policy in ways which satisfied business interests but crucially, without undermining the effective, collaborative basis upon which much of the small firm business sector had successfully developed its capacity for competitiveness over the preceding three decades. That is, the regional government now had to defend its previous, in some cases highly successful, interventions to support networking and innovation against a newly resurgent business services sector which had always been hostile, but had not been capable of providing better business services to SMEs.

The approach that has now been adopted by ERVET is that funding for business support must be conducted as a project-based competitive tendering process. In this way, excellent business support service centres will be likely to retain their funding while those that have performed sub-optimally are more likely to lose it. Cash saved in the latter exercise is then conceivably available to fund further innovative projects.

Amongst the latter could be projects which meet the widely-perceived and agreed need for Emilian small firms themselves to become more innovative. Not least, this is expected to require that ways be found for small firms to engage in collaborative research projects with universities or research institutes. There is little experience of direct university-industry research collaboration in Italy generally because until 1992 it was constitutionally unacceptable. A change of law has since made it possible, but the learning curve even for large, let alone small,
enterprise is a steep one. Links with research institutes are stronger, even for Emilian small business. The successful collaboration between CITaR, the textiles innovation centre at Carpi, near Bologna, and ENEA, the energy research institute, resulted in an innovative CAD-CAM system for knitwear firms, now widely marketed both inside and outside Italy.

Of great interest to the project of assisting small firm competitiveness without losing the collaborative or networking philosophy of niche-marketing, is the recent research reported by the Emilia-Romagna regional Department of Industry (Franchi, 1994). The Department of Industry asked the question: what has been going on in the industrial districts during the past three or four years, especially the recent years of economic recession? For example had there been, as the soothsayers were foretelling, an increase in the hierarchisation of firms in the districts; were there strong signs of concentration of ownership; had relationships with the economic world outside the localised districts changed; were recent developments still compatible with the policy and political goal of social integration rather than social polarisation?

The main conclusions of the research are as follows: first, firms in industrial districts performed better in terms of employment and wages than firms in the same sector not located in districts. Though it is not stated, it can be assumed that turnover performance was also better. Second, all districts increased the volume of their operations occurring outside the district, even outside the region, seeking lower labour costs. In Carpi, between 1988 and 1992 offshore production (i.e. outside Italy) increased from 7 per cent to 9 per cent of total turnover. Third, upstream and downstream diversification by district firms was only marginal, and innovation was limited. Fourth, vertical integration occurred to a limited extent as some, but relatively few, multinationals acquired district-based firms. Fifth, formation of groups of independent small firms was much the most common form of integration (or quasi-integration) between firms within the districts. Sixth, companies employing around 20 people grew strongly, while those employing five or less showed a higher death-rate than birth-rate. Seventh, there is a radical change in the management of the small firms employing up to and over 20 or so persons. A minimum efficient size seems to have emerged below which organisational demands upon the contemporary firms cannot be adequately satisfied.

In conclusion, small firms in industrial districts gain substantially from operating in a collaborative, networked business milieu. They have been able to offer better levels of employment, better wage-levels and, for the larger small enterprises, higher rates of growth than firms in the same industry not operating in a district-type setting. Firms in districts have, like large companies, sought and found overseas. Lower labour costs have been a feature of scale without losing the benefits in different size and type.

Thus, there is evidence of cooperation, nevertheless, being confronted in different ways. The imperative of enhancing response of greater and greater isofa is a reasoned and sensible approach means a problem halved, that option survives and gains in efficiency and

(ii) Conclusions

There are three inter-linked conclusions to account of recent developments in summarising these, it is important to point out parameters within which these changes unfolded, generic element within globalisation, particularly in the sense of penetration of domestic markets for defining parameter of the present economic deregulation, it creates enormous un_predictability in a situation where, because they do better than doing nothing. This (1994) has referred to as 'bootstrapping' regional governments.

A second, key, parameter of the private sector amongst the alert firms and institutions, survival. By innovation is meant not just by managerial, organisational and firms in districts begin seeking to reframe developed by Goss, Pascale ' enough' and firms must engage in processes and culture not once but permanently. Some contexts are better, The innovative firm must constant function successfully, but so must the

Networking is one name given to social learning, trust-building, partnership. Emilia-Romagna has a comparatively
Research institutes are stronger, even in the collaboration between CITER, pl, near Bologna, and ENEA, the innovative CAD-CAM system both inside and outside Italy.

Sustaining small firm competitiveness or networking philosophy of the Emilia-Romagna region described by the Emilia-Romagna (anchi, 1994). The Department of Labor has been going on in the industrial years, especially the recent years of there been, as the soothsayers were sion of firms in the districts; were ownership; had relationships with举动 districts changed; were recent policy and political goal of social i.

The are as follows: first, firms in terms of employment and wages aed in districts. Though it is not per performance was also better. Some of their operations occurring region, seeking lower labour costs. The of total turnover. Third, upstream district firms was only marginal, and al integration occurred to a limited Districts acquired district-based independent small firms was much on (or quasi-integration) between enterprises employing around 20 people five or less showed a higher there is a radical change in the up to and over 20 or so persons. to have emerged below which contemporary firms cannot be.

districts gain substantially from the business milieu. They have been att, better wage-levels and, for the growth than firms in the same setting. Firms in districts have, like large companies, sought and found suppliers elsewhere in Italy and overseas. Lower labour costs have been the main incentive for doing this. Small firms in districts have been able to acquire some of the advantages of scale without losing the benefits of scope, by forming groups of different size and type.

Thus, there is evidence of competitiveness problems which are, nevertheless, being confronted in new, often increasingly collaborative ways. The imperative of enhancing competitiveness is not producing the response of greater and greater isolationism or 'rugged individualism' but a reasoned and sensible approach in which, where a problem shared means a problem halved, that option is taken. In the process the small firm survives and gains efficiency and effectiveness.

(ii) Conclusions

There are three inter-linked conclusions to be drawn from this limited account of recent developments in regional industrial practice. Before summarising these, it is important to restate two key factors which set the parameters within which these changes operate and remind ourselves of a third unfolding, generic element which constitutes a key response. First, globalisation, particularly in the sense of a heightened capacity for the inter-penetration of domestic markets by foreign producers is a key, even defining parameter of the present economic conjuncture. In tandem with deregulation, it creates enormous uncertainty of the kind that leaves firms in a situation where, because they do not know what to do, doing anything is better than doing nothing. This creates a mentality to which Sabel (1994) has referred as 'bootstrapping reform' among firms, unions and regional governments.

A second, key, parameter of the present turbulent context, is the sense amongst the alert firms and institutions, that innovation is the key to survival. By innovation is meant not only product or process innovation but managerial, organisational and cultural innovation. This is where firms in districts begin seeking to re-invent themselves. This follows the theme developed by Goss, Pascale & Athos (1993) that 'change is not enough' and firms must engage in 'heroic acts' to reinvent products, processes and culture not once but permanently to maintain competitive advantage. Some contexts are better than others in which to achieve this. The innovative firm must constantly interact with its environment to function successfully, but so must the innovative region.

Networking is one name given to such a form of interactive exchange, learning, trust-building, partnering and empowering practice. If Emilia-Romagna has a comparative (competitive) advantage, it lies
precisely in the rich milieu of other firms, institutions and informed personnel which constitutes the regional economy. Through the information flows made possible by the innovative regional business infrastructure found in the region, firms are able to engage in rapid response to turbulent conditions. Even when the ‘institutional reflexivity’ (Cooke, 1995), in which the public and private elements of the network architecture are engaged, is not synchronised with business needs, there is enough useful information flowing informally for firms to be able to experiment with their own bootstrapping solutions. These then become demonstration models for the rest.

The three key conclusions concerning the Emilia-Romagna case are as follows. First, the insight of the evolutionary economics approach, that firms are collective organisations with a degree of resource-development capacity rather than simple utility-maximisers is given support, as is the proposition that they are capable of learning new ways to solve problems successfully. In this case, technology was endogenously developed within the organically-linked network and tailored to the needs of the production system rather than purchased ‘off-the-shelf’ as implied in traditional neo-classical economic theory (although for a recent re-formulation, see Romer, 1990). Second, the ‘economies of association’ in a highly networked system, such as that described, clearly provide the means whereby SMEs, in a collaborative mode of economic co-ordination, can respond tactically to a threatened loss of market-share relatively rapidly. The close relationship between the Innovation Centre CITaR and the multitude of firms in the same industry and locality makes for the possibility of rapid exploitation of externalities. However, and third, while the production system in the industrial districts rests on the platform of inherited ‘social capital’ of community solidarity, there are some political costs attached to the kind of policy intervention that results. It took four years to resolve the crisis of the regional governance system in such a way that the innovative potential of networked enterprise could be retained in the face of political demands from inside and outside the region that more scope should be given to a more deregulated system of enterprise support. Nevertheless, such paralysis does not yet seem to have harmed the Emilian system noticeably.

1. INTRODUCTION

Baden-Württemberg has, for the model economy (Table 3.1). With industrial investment, exports quality, high value and well-er overcame the problem which establish and maintain competitive advantage appeared to be competitive advantage; that is, Baden-Württemberg combined a enterprise and Mittelstand sector importance to this has been the capital goods, notably machines to

### Tabelle 3.1: Baden-Württemberg

<table>
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<tr>
<th>indicators</th>
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<tr>
<td>Population (1991)</td>
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<td>Labour Force Participation Rate (1991)</td>
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<td>Employment in Agriculture</td>
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<td>GDP per capita (1991: in Per Cent of EU Average)</td>
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<td>Unemployment Rate (1993)</td>
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Source: Eurostat.
CHAPTER 3

BADEN-WÜRTTEMBERG: SMALL-FIRM PROBLEMS AND REGIONAL RESPONSES IN MACHINE TOOLS

1. INTRODUCTION

Baden-Württemberg has, for the past twenty-five years been seen as a model economy (Table 3.1). With low levels of unemployment, high rates of industrial investment, exports and incomes and a reputation for high quality, high value and well-engineered products, it seemed to have overcome the problem which besets most economies, namely how to establish and maintain competitive advantage. At the heart of that achievement appeared to be a factor that increasingly explains competitive advantage; that is, the capacity to innovate. Uniquely, Baden-Württemberg combined innovative capacity within both its large enterprise and Mittelstand sectors and, crucially between them. Of key importance to this has been the integration of supply and demand for capital goods, notably machine tools within the regional economy.

| TABLE 3.1 |
| Baden-Württemberg – Economic Indicators |

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<th>Baden-Württemberg</th>
<th>EU (EUR 12)</th>
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<tr>
<td>Population (1991)</td>
<td>9.9 million</td>
<td>344.8 million</td>
</tr>
<tr>
<td>Labour Force Participation Rate (1991)</td>
<td>59.4% (women: 47.2%)</td>
<td>55.1% (women: 43.4%)</td>
</tr>
<tr>
<td>Labour Force (1991)</td>
<td>4.8 million</td>
<td>142.0 million</td>
</tr>
<tr>
<td>Employment in Agriculture</td>
<td>3.4%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Industry</td>
<td>46.2%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Services</td>
<td>50.3%</td>
<td>60.3%</td>
</tr>
<tr>
<td>GDP per capita (1991: in Per Cent of EU Average)</td>
<td>136%</td>
<td>100%</td>
</tr>
<tr>
<td>Unemployment Rate (1993)</td>
<td>4.1% (women: 4.5%)</td>
<td>10.4% (women: 12.2%)</td>
</tr>
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</table>

Source: Eurostat.
The most recent German economic recession had very marked effects on manufacturing, especially of engineering goods, particularly machine tools in Baden-Württemberg. In the past, threats to the model have been short-lived, not least because the governmental and institutional system in which the economy was embedded had also proved to be an innovative governance structure. At present, the innovativeness of both economy and governance structure are in question. In this chapter an attempt will be made to explain this, focusing particularly upon the machine tool industry, and explore some realistic options for change and renewal.

2. BADEN-WÜRTTEMBERG: LOSING COMPETITIVE ADVANTAGE

A special Baden-Württemberg problem is that, as Semlinger (1993) puts it, ‘... price competition has reached high-end markets and threatens to turn a former competitive advantage into a handicap. ... Correspondingly what was appreciated as a state-of-the-art product is now considered ‘over-engineered’.’ The logic of this is that there has to be a thorough rethink about the nature of products, markets and competencies rather than simply adding more variations to the solutions which worked before.

Recently, Baden-Württemberg’s Zukunftskommission (Future Commission) compiled a report, Economy 2000. It concluded that the present crisis is due to:

- **International Competition:** The regional clusters based on automotive, machinery and electrical engineering are facing increased competition from Japan, Asian NICs, Eastern Europe and the European Union after the establishment of the Single Market. For instance, Japanese imports have taken 25 per cent of the German market in CNC turning machine tools; Japan has 50 per cent of Asia-Pacific machine tool imports compared with Germany’s 12 per cent. Japanese machine tool firms have 30 per cent lower costs, less time-to-market, high quality and good after-sales service (Ministry for Economics, Press Release 5-2-93);

- **Innovation Deficits:** Baden-Württemberg firms are weak in semi-conductors, computers and IT communications, a problem because of the global importance of Information and Communication Technologies. Also, there are serious weaknesses in some new materials and particularly biotechnology. Baden-Württemberg is innovative in mature technologies but these are being driven out by the new sectors;

- **Production Costs:** Wh incentives to promote Economics Rexrodt at (DM2bn.) aimed at SMI Hans Peter Stihl (Pres Commerce) suggests we deal with the crisis (Sud

The Future Commission in Ecol

- **Competition Measures**
  - costs; time-to-market; training; business servi
  - innovation – should all b

- **Innovation Measures**
  - future-oriented and raise
  - Board should be estab
  - dialogue and achieve co
  - should engage in techno
  - make recommendation;

- **Production Costs:** Shoul
  - gains through moving it
  - improving locational fac
  - flexibility and becoming ri
  - per cent of German expor
  - East and South-East Asia
document, Economy 2000)

The response to this has been some Employment Office criticised i
-unemployment level from reaching called for a Japanese MITI for the
-investment; state venture-capital fu
-hardware to software; and tax-relie

(i) **The Crisis in the Machine Ti**

Japan is the world’s largest, Germ
-machine tools, as is shown in Ti
-Germany’s share of world producti
-as the USA, for example, has revi
-producers, including Taiwan and c

share.
ion had very marked effects on the goods, particularly machine threats to the model have been mental and institutional system also proved to be an innovative nature of both economy and this chapter an attempt will be largely upon the machine tools for change and renewal.

**LOSING COMPETITIVE**

that, as Semlinger (1993) puts low-end markets and threatens to a handicap. ... Correspondingly art product is now considered that there has to be a thorough market and competencies rather solutions which worked before. *Zukunftskommission (Future ny 2000. It concluded that the regional clusters based on critical engineering are facing a, Asian NICs, Eastern Europe the establishment of the Single imports have taken 25 per cent of machine tools; Japan has 50 e tool imports compared with machine tool firms have 30 per market, high quality and good Economics, Press Release Württemberg firms are weak in IT communications, a problem stance of Information and so, there are serious weaknesses particularly biotechnology, in mature technologies but new sectors;

- **Production Costs**: While Economics Minister Spöri demands tax incentives to promote investments, Federal Minister of Economics Rexrodt advocates credits to promote innovation (DM2bn.) aimed at SMEs. Meanwhile industry, as represented by Hans Peter Stihl (President of IHKs, Chambers of Industry and Commerce) suggests workers should accept lower wages to help deal with the crisis (Sudwestpresse, 29-12-93).

The Future Commission in Economy 2000 recommended:

- **Competition Measures**: Better firm organisation; lower labour costs; time-to-market; tax-structure; infrastructure; vocational training; business services; firm culture and the climate for innovation – should all be improved;

- **Innovation Measures**: Baden-Württemberg should be more future-oriented and raise awareness of this. A Land Innovation Board should be established to initiate the future-oriented dialogue and achieve consensus. This now exists. The Board should engage in technology foresight, develop scenarios and make recommendation;

- **Production Costs**: Should be reduced by seeking productivity gains through moving into new technologies and industries, improving locational factors such as wage-costs and labour flexibility and becoming more globally competitive (e.g. only 6.4 per cent of German exports go to the USA, only 7.0 per cent to East and South-East Asia (as reported in *Zukunftskommission’s document, Economy 2000*).

The response to this has been somewhat critical; the President of the Land Employment Office criticised it for offering little to prevent the unemployment level from reaching 300,000. Economics Minister Spöri called for a Japanese MITI for the Land and demanded: increased R&D investment; state venture-capital funds; assistance for firms to move from hardware to software; and tax-reliefs for modernisation by firms.

(i) **The Crisis in the Machine Tool Industry**

Japan is the world’s largest, Germany, the second-largest, producer of machine tools, as is shown in Table 3.2. However, both Japan and Germany’s share of world production has fallen in the period after 1990 as the USA, for example, has revived its world share and China and newer producers, including Taiwan and others, have increased world-market share.
In addition to German world market by 1993, plus almost 30 per cent export share – unlike that of Japan during 1992-93. This is exemplified by the share increase of some 17 per cent of the industry, which was thought to be by 20 per cent.

(ii) The German Machine Tool Industry

What are the problems of the German machine tool umbrella producers are too numerous and sensibly market. Furthermore, builders of power to create a global presence: Germany (salaries, benefits and oil per cent higher than in Japan and 3. Germany, the key competitor is Japan cent of world output and 49.4 per cent of high labour costs from domestic customers. Product anticipated response to customer good as they need to be rather than Baxter, 1994).

One of Germany’s and Baden-V-Baden machines, with the new machines to keep up with the valve ones on a 20 to 25 per cent (1994). But, interestingly, Leibinger firms should merge. Concentration less, vulnerable to wipe-out in this family-owned businesses add to this especially in difficult times’ (quoted and acquisition option is seen as be from outside (sub-contractors) and from the end. Mittelstand firms enjoy internal social capital built up over decades of increasing scale by merger is seen as positive aspects of the machine-tool
In addition to German world market share declining below its 1990 level by 1993, plus almost 30 per cent decline from 1991 to 1993, German export share – unlike that of Japan, Italy, USA and Taiwan – also fell during 1992-93. This is exemplified in Table 3.3 which shows a German export share decline of some 17 per cent compared to a Japanese export share increase of some 25 per cent. Even the American machine tool industry, which was thought to be in serious decline, increased export share by 20 per cent.

(ii) The German Machine Tool Industry

What are the problems of the German machine tool industry? Cecimo, the European machine tool umbrella association, says standard machinery producers are too numerous and small to compete effectively on the world market. Furthermore, builders of specialist machines lack the financial power to create a global presence and survive recessions. Social costs in Germany (salaries, benefits and other employee-related expenses) are 27 per cent higher than in Japan and 37 per cent higher than in the USA. For Germany, the key competitor is Japan. Together they account for 43.5 per cent of world output and 49.4 per cent of world exports. Germany is confronted with high labour costs and new demands for cost-reductions from domestic customers. Production outside Germany (W) is an anticipated response to customer demand for machine tools that are as good as they need to be rather than, in Germany, as good as possible (Baxter, 1994).

One of Germany’s and Baden-Württemberg’s leading industrialists, Berthold Leibinger, head of Trumpf, is quoted as recognising that Mittelstand machine tool producers’ love of independence has blinded companies to the need for strategic mergers and that their obsession with technology led them into a trap of making sophisticated products for their own sake without accounting for customer’s needs. ‘We are trying to introduce new machines with the same or improved technical features as the old ones but with a 20 to 25 per cent cost reduction’ (quoted in Waller, 1994). But, interestingly, Leibinger rejects the notion that Mittelstand firms should merge. Concentration would have left the industry more, not less, vulnerable to wipe-out in this recession. He concludes: ‘Independent family-owned businesses add stability to the business community, especially in difficult times’ (quoted in Waller, 1994). Clearly, the merger and acquisition option is seen as being detrimental to the advantages of externalities coming from outside the SME, both from other firms (sub-contractors) and from the enterprise support system. Moreover, Mittelstand firms enjoy internal ‘economies of association’ from the social capital built up over decades of good management-labour relations. Increasing scale by merger is seen as holding the threat of destroying these positive aspects of the machine-tool ‘economy culture’.
One of the German machine tool industry’s key weaknesses, apart from scale – which makes the pressure for productivity gains more difficult – is a somewhat incestuous outlook regarding innovation. A study of differences between innovation in the German and Japanese industries (Ruth, 1991) concluded that the German industry is very dependent on customers for innovation stimulus, and rather inward-looking, at the firm-level, for responding to innovative user-requirements. Japanese firms, by contrast, learned more about the market’s requirements by engaging more wholeheartedly in marketing as a business activity. This, in turn, is a reflection of the relative size advantage of Japanese over German firms. This enables them to organise differently and to employ specialist marketing personnel.

Despite the view of Berthold Leibinger that scale was not a key problem, it is, nevertheless, worth indicating the differences between German and Japanese machine tool firms on this dimension, as is done in limited ways in the report of Brödner & Schultetus (1992). They took a representative sample of firms from both countries and examined them not so much from the viewpoint of scale as whether or not they could be said to be engaging in ‘Lean Production’. The key findings, summarised in Table 3.4, showed that there was a massive productivity gap between German and Japanese firms.

### TABLE 3.4

**Key Economic Indicators of Japanese and German Machine Tool Firms**

<table>
<thead>
<tr>
<th>Selected Firms</th>
<th>Japan 1990</th>
<th>German Average 1989</th>
<th>Germany 1990</th>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Turnover per Employee (DM'000)</td>
<td>650</td>
<td>795</td>
<td>725</td>
</tr>
<tr>
<td>Value Added per Employee</td>
<td>336</td>
<td>517</td>
<td>249</td>
</tr>
<tr>
<td>In-House Production (%)</td>
<td>52</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>After-Tax Profits (%)</td>
<td>14</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Labour Costs/Turnover (%)</td>
<td>10</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Stocks/Turnover (%)</td>
<td>15</td>
<td>17</td>
<td>22</td>
</tr>
</tbody>
</table>


Of particular interest is the higher turnover per employee. Profits were much higher, labour and stockholding as a average than in the German outlook for German machine firms.

(iii) Selected Cases in Baden

For simplicity, machine tool firms into:

- Producers of Complete
- Part-Producers and Sub

Three examples of each are presented with Chief Executive Officers (case examples give an indic Hürtemberg machine tool industry, thereby presented.

(iv) Producers of Complete A

One important change for such producers. Traditionally, sales price was \( p \) plus a margin. Now, with \( \text{SIMA} \) being developed by teams of \( N \) engineers working in combination based on detailed market research and Germany plus other export; from which costs of production; This cost-target approach has been competition. In Trumpf, it is known as (TOP). Trumpf is a world-lead CEO-level and willing to adapt it producing, for example, partly-Anglo-American markets.

World leader firms in the production affected by the two key force Production. Japanese firms are unique in how it enables them to make years. Firms from a mechanical entity to keep ahead in the electronics as
Of particular interest is the size difference of typical firms, the much higher turnover per employee and value-added per employee in Japan. Profits were much higher, labour-costs as a percentage of turnover much lower and stockholding as a percentage of turnover slightly less an average than in the German case. All in all this represents a sombre outlook for German machine tool producers.

(iii) Selected Cases in Baden-Württemberg

For simplicity, machine tool firms in Baden-Württemberg can be divided into:

- Producers of Complete Machines;
- Part-Producers and Sub-Contractors.

Three examples of each are presented below, based on detailed interviews with Chief Executive Officers (CEOs) conducted in Autumn 1992. These case examples give an indication of the dualisation of the Baden-Württemberg machine tool industry and the challenges and opportunities thereby presented.

(iv) Producers of Complete Machines

One important change for such firms concerns thinking about cost. Traditionally, sales price was worked out by adding cost of production plus a margin. Now, with ‘simultaneous engineering’, (i.e. new products being developed by teams of marketing, production, R&D and control engineers working in combination), marketing arrives at a design price based on detailed market research in the main markets of Italy, France and Germany plus other export areas. This becomes the sale price target from which costs of production are deducted, leaving a profit margin. This cost-target approach has been adopted purely because of Japanese competition. In Trumpf, it is known as Trumpf-Optimierungs-Programm (TOP). Trumpf is a world-leader company, independent-minded at CEO-level and willing to adapt its products to meet market requirements, producing, for example, partly-manual machines for the price-sensitive Anglo-American markets.

World leader firms in the production of sawing machine tools are also affected by the two key forces of Japanese competition and Lean Production. Japanese firms are on average ten times bigger and this size difference enables them to make technology jumps every two or three years. Firms from a mechanical engineering tradition doubt their capacity to keep ahead in the electronics aspect of production in which the Japanese

<table>
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<tr>
<th>German Average 1989</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Germany 1990</th>
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</table>
Lean Production pressures from customers are causing them to buy, rather than make, more of their product.

(v) Part-Producers and Sub-Contractors

There is a variation ranging from the highest quality flexibly-specialised firms, to high quality, flexible but, to varying degrees, dependent firms. The point to look for here is that the cost-squeeze on such firms, irrespective of their relative sophistication, is causing them to make significant changes in their business methods.

Specialist cutting machine tool firms have largely been shielded from the recession in the industry thus far. Total employment was relatively stable to July 1994. One company has recently set up a service base in the UK market to sub-contract to a number of UK machine tool firms, a decision stimulated by the VDMA’s (Machinery Industry Association) recommendation that the Mittelstand’s survival depended upon such global co-operation due to shrinking markets and the small scale of German machine tool firms. In the domestic market, competition is still seen as the key to promoting innovation.

For firms that have gone down the lean sub-contractor route, perhaps as a supplier to the Japanese, the experience of an Achern firm is instructive. Its machine building expertise developed in the early 1980s when, during recession, the company began to assemble machines, never to its own design, always sub-contracted. In the main, cloth-cutting machines were assembled, but in recent years a contract was made with Citizen, the Japanese watch-making firm. Citizen was responsible for sending shock-signals through the German machine-tool industry when they bought Boley, an established Esslingen precision (spindles) machine tool firm. Citizen, in 1989, needed the ‘Made in Germany’ label to overcome EC import restrictions. The link with Citizen was facilitated by the GWZ, the BW Agency for International Economic Co-Operation. Now that Boley has been restructured and demand is flat, the contract has finished.

Hence, the dependent supplier firms, ranging from the highly specialised to the most flexibly-advanced, face serious organisational and locational problems. At the highest value-added end of production, it is unlikely that such firms will leave the Black Forest. But long lead-times for parts mean competitors can penetrate a market already developed. Costs of parts-production are high enough that global sourcing from Eastern Europe is a virtual imperative for low value-added items. Moreover, the increasing uncertainty in the machine tool market means that firms engaging in flexible sub-contracting have, increasingly, to be willing to diversify beyond that industry to survive. It appears that a hierarchical structure may be emerging in egalitarian industry.

(vi) Weaknesses of the Baden-Württemberg System

There are many and deeply-felt weaknesses and these are the following which w Morgan, 1990; Cooke, Morgan &

- The high levels of instability in the support system. Although government, intermediary rather than quantitative processes operate efficient Ministry of Industry’s A Mittelstand machine-tool half-year is a case in point.

- The manufacturing base of ‘Post-industrial’ economies under which make Baden-Württemberg relative insignificance. W Automotive engineering is not a sector and one from which future (e.g. the ‘green’ car) can draw much benefit;

- The export orientation is a major problem and one which do not. Baden-Württemberg focused on developed coun simpler requirements of N this they need to engage in with the state government Yokohama, Japan and Sing have been established;

- The skills of the region are quality diversified products machine tool companies. Moreover, it probably benefit Baden-Württemberg (Braczyk);

- Finally, technology, and ad been a strength of the machi
(vii) Weaknesses of the Baden-Württemberg Machine Tool Industry

There are many and deeply-founded strengths in the industry. Amongst these are the following which we have stressed in the past (Cooke & Morgan, 1990; Cooke, Morgan & Price, 1993):

- The high levels of *institutional intelligence* in the industrial support system. Although much of the impact of relations among government, intermediary institutions and industry is qualitative rather than quantitative, information and policy guidance processes operate efficiently and effectively. The response to the Ministry of Industry’s A.D. Little report on the problems of *Mittelstand* machine-tool and automotive firms in under a half-year is a case in point;

- The manufacturing base of the region is, in itself, a strength. ‘Post-industrial’ economies have major problems of productivity under which make Baden-Württemberg’s problems pale into relative insignificance. While the very long-term future of the automotive engineering economy may be in doubt, it is a core-sector and one from which transportation development of the future (e.g. the ‘green’ car, public transport and aerospace) can draw much benefit;

- The *export orientation* is important. Firms which export their output are more effective and have a more secure future than those which do not. Baden-Württemberg’s machine tool firms have focused on developed country markets and need to adjust to the simpler requirements of Newly Industrialising Economies. For this they need to engage in more export-co-operation in concert with the state government and banks (as, for example, at Yokohama, Japan and Singapore where German Industrial Parks have been established);

- The *skills* of the region are especially well-suited to the ‘high quality diversified production’ (Streeck, 1989) typical of many machine tool companies. Furthermore, it seems that, although the machine tool industry does not over-skill its workforce as much as others, it probably benefits from the high training densities in Baden-Württemberg (Braczyk et al, 1993);

- Finally, *technology*, and advances in its application, has clearly been a strength of the machine tool industry. Quality, reflected in
a high price has, until recently, proven to be a competitive advantage of massive proportions, and one which has appealed to customers in the most exacting markets, including, of course, Germany itself. This high quality, high value-added focus has enabled relatively high wages to be paid to highly skilled workers. Quality is in short-supply. The new trick is to keep quality high while reducing price significantly. This requires high productivity and low unit labour costs, not a reduction in quality _per se_.

Despite these strengths, there are significant weaknesses in Baden-Württemberg’s machine tool industry. There are five of these:

- **Machine tool firms** in Baden-Württemberg have had a reputation for _slow delivery_. As a case in point, the Ford Motor Co. engine plant at Bridgend in Wales used to source machine tool supplies from Kieninger Tooling in Lahr, Schwarzwald. However, Kieninger were quoting 26 weeks delivery time, stressing it as a standard. This led to Ford looking for and finding local tooling suppliers;

- **Over-engineering** is a particularly pronounced problem (which, of course, used to be considered an advantage). The perfectionism of the Swabian ‘proud engineer’, with his ‘pfiffige’ mentality and priority given to engineering excellence over price, has added costs to machine tool production. Having a similarly-minded set of customers such as Mercedes and Porsche has not helped overcome this ‘tinkering’ restlessness, a factor heightened by Japanese price-competition;

- Despite strengths in **occupational skills**, machine tool firms are more hierarchical, less transparent, with less frequent consultation and information flows than is the case typically in Japanese machine tool firms. There is a marked skill division of labour with _Meister_ reinforcing hierarchies and sometimes hindering the development of multi-skilling (e.g. mechatronics) in machine tool firms (Brödner and Schultetus, 1992);

- It seems that _investment in innovation_ has fallen away in the past decade or so. Braczyk _et al._ (1993) report that since 1989 Baden-Württemberg machine tool firms have cut R&D spending and that the quality and quantity of investment in capital generally has not been high since 1973. Naschold (1993) is referred to as criticising machine tool products for being too complex for the fast-growing markets of the Far East and Latin America.

As a consequence of these factors, all of which point to a problem of conservatism, rigidity and an unwillingness to experiment, there has, according to Braczyk _et al._ (1993) Baden-Württemberg machine-tool

These points were further under conclusions to the effect that the . the meeting, he convened wi association), IHKs, IG Metall (a specific weaknesses were highligl

- Absence of Japanese-qu long-term dependence and
- **Product complexi time-to-market, and set-up;
- Insufficient use of lean m engineering to allow low-i
- Inadequate back-up sales : ASEAN trade area;
- Insufficient collaboration and product development,

Lastly, though it is not mentioned i the machine tool industry ha consequences for its region. Its Stuttgart, Esslingen, Ludwigsb Enzkreis, Ortenukreis, Heilbronn located in small semi-rural locatio the past, environmental effects cc environmental regulations may co to costs in the process. But the over-congested, especially in poter needs to be given to controlling encouraging more use of the exten threatened) rural rail system enjoy

3. **OPTIONS FOR CHANGE**

Is it possible to have worl world-class machine tools world-class tools if one has

Countries with superior m superior industrial growth (Th

Although Lester Thurow is here manufacturing in general, and mac
oven to be a competitive force which has appealed to markets, including, of course, high value-added focus has led to highly skilled workers, risk is to keep quality high is requires high productivity in quality per se.

Int weaknesses in Baden-are five of these:

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according to Braczyk et al (1993) been a productivity downturn in the Baden-Württemberg machine-tool industry.

These points were further underlined in Economics Minister Spöri’s conclusions to the effect that the status quo was no longer an option. At the meeting, he convened with VDMA, VDI (general industry association), IHKs, IG Metall (a trade union) and firms, the following specific weaknesses were highlighted:

- Absence of Japanese-quality control technology resulting in long-term dependence and know-how erosion;
- Product complexity causing product development, time-to-market, and set-up times to be uncompetitive;
- Insufficient use of lean management principles or simultaneous engineering to allow low-inventory production;
- Inadequate back-up sales and service networks, especially in the ASEAN trade area;
- Insufficient collaboration in purchasing, production, marketing and product development, hence no modularisation.

Lastly, though it is not mentioned in any of the industry critiques as such, the machine tool industry has some significant environmental consequences for its region. Its dispersed character, with centres in Stuttgart, Esslingen, Ludwigsburg, Rems-Murr-Kreis, Göppingen, Enzkreis, Ortenaukreis, Heilbronn, Reutlingen and Karlsruhe, much of it located in small semi-rural locations, means movement of goods and, in the past, environmental effects could be treated as a public cost. New environmental regulations may control the latter to some extent, but add to costs in the process. But the Baden-Württemberg road-system is over-congested, especially in potentially quiet, rural areas. Consideration needs to be given to controlling industrial use of rural roads and encouraging more use of the extensive (but with privatisation, no doubt threatened) rural rail system enjoyed in the Land.

3. OPTIONS FOR CHANGE

Is it possible to have world-class manufacturing without world-class machine tools? No! Is it possible to have world-class tools if one has to depend upon imports? No! Countries with superior machine tool industries exhibit superior industrial growth (Thurow, 1992).

Although Lester Thurow is here trying to exhort the USA to take manufacturing in general, and machine tools in particular, seriously as
any good economic nationalist would, he nevertheless has a point. It is unthinkable that the first option, letting the industry die in Baden-Württemberg, can be seriously advocated. Despite present problems, it is perhaps the world’s finest and, in terms of embedded know-how, has a value that will persist even if cheaper production can be obtained elsewhere.

A second option, already mentioned, is that the scale of firms in the industry should be increased to match that of the Japanese. As Brödner & Schultetus (1992) put it:

The *Mittelstand* German machine tool firm appears to be something of a David versus Goliath ... The stark difference between the largest Japanese and German firms leads one to the conclusion that the capital power of the Japanese allows them a worldwide capacity to act, while the Germans are possibly losing access to markets (Brödner & Schultetus, 1992).

In addition to this, technological change means that stand-alone machining centres requiring integrated systems of software, electro-mechanical hardware and new organisational techniques leading to Computer Integrated Manufacturing (CIM) have become *de rigeur*. Here the Japanese have the necessary scale, organisationally and technologically (e.g. Fanuc’s new 32-bit control system), while no German firm does.

Attempts to create the necessary scale amongst German machine tool firms appear to be foundering. Outside Baden-Württemberg, the Deckel-MAHO merger has resulted in the joint company filing for insolvency protection with debts of DM140 million in the year to June 1994. Pre-existing collaborations between Deckel and Gildemeister, MAHO and Traub, MAHO and Berthold Hermle do not seem to have helped (Eisenhammer, 1994). As Dieter Weidemann, CEO of Pittler, one of Europe’s largest machine tool groups, argued:

Size offers no way out, for you cannot compete against the Japanese and Koreans with series machines made in Germany. The cost will always be 10-15 per cent higher (Cooke, Morgan, Price, 1993).

The option of vertical integration, seeking scale in the embrace of IBM or Nixdorf was rejected by Deckel because, as Assistant Chairman Peter Bachsteitner put it:

... we see the danger that one day we will no longer be able to enter into discussions since we will have become a mere iron and steel supplier (Cooke, Morgan, Price, 1993).

There seems to be no option of strengths of the existing system hold out possibilities as they have (Dempsey, 1994). Evidently, on quality and innovativeness ... they know they will lose inexpience in mass markets. lose their know-how in the all part of the machine. Hence, they are falling into the worst of all cate 'proud engineer', namely that one is the mentality which defines fully recognising the untenab even middle way as an alternative.

Instead of vertical collaboration groups may offer scale while maintaining and lowering price. The virtue may be on the horizon. Recent Emilia-Romagna, Tuscany and group-formation has enabled firms in their sector generally (Franchi, Canullo, 1994). Similarly, when components firms found pressure for further innovation from large cut by the Ministry of Industry, it sponsored a number of technolog third parties with independent IHKs. The ‘honest-broker’ hold proprietorial know-how was that independent competitors.

The aim here is to enhance cap sub-systems, components and interfaces, graphically interactive thus be produced by means of a distributed system. These generic system attendant price diminution but at compete in their particular marks these standardised parts. Ideally contain different types of machin, the advantages of collaboration potential know-how appropriate arrangements could obviously be even training amongst group-me
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ce, 1993).
There seems to be no option other than an innovative re-thinking of the
strengths of the existing system, although Traub clearly believes mergers
hold out possibilities as they have just united with Heckert of Chemnitz
(Dempsey, 1994). Evidently, German firms seek to continue to compete
on quality and innovativeness. If they take on the East Asians at their own
game they know they will lose both from going downmarket and from
inexperience in mass markets. If they merge with computer firms, they
lose their know-how in the all-important value-adding control systems
part of the machine. Hence, they see themselves as being in danger of
falling into the worst of all categories from the viewpoint of the German
‘proud engineer’, namely that of becoming a mere ‘metal-bender’. This
is the mentality which defines attachment to a ‘high road’ future, while
fully recognising the untenability in this context of taking on a low or
even middle way as an alternative.

Instead of vertical collaboration or merger, lateral co-ordination into
groups may offer scale while retaining quality, increasing productivity
and lowering price. The virtuous circle that currently escapes the industry
may be on the horizon. Recent evidence from the industrial districts of
Emilia-Romagna, Tuscany and Marche in the Third Italy, suggests
group-formation has enabled firms in industrial districts to out-perform
their sector generally (Franchi, 1994; Dei Ottati, 1994; Alessandrin &
Canullo, 1994). Similarly, when, in 1992, machine tool and automotive
components firms found pressures for them to engage in further and
further innovation from large customers, the Little report, commissioned
by the Ministry of Industry, recommended the Land government to
sponsor a number of technology-related model projects moderated by
third parties with independent status, such as Fraunhöfer Institutes or
IHKS. The ‘honest-broker’ holding the ring was seen as essential if
proprietary know-how was to be protected amongst still-fiercely
independent competitors.

The aim here is to enhance capability for modularisation of systems,
sub-systems, components and parts. Control systems, mechanical
interfaces, graphically interactive and programmable logic systems could
thus be produced by means of a division of responsibilities amongst group
members. These generic systems could thus be produced to scale with
attendant price diminution but at high quality. Individual firms can then
compete in their particular market on the basis of efficient acquisition of
these standardised parts. Ideally, groups would be risk-spreading and
contain different types of machine tool specialist, thus further enhancing
the advantages of collaboration while minimising the disadvantages of
potential know-how appropriation by competitor firms. Similar kinds of
arrangements could obviously be extended to purchasing, marketing and
even training amongst group-members.
Baden-Württemberg has always been thought to have a strong system of intermediary business support institutions. Examples like the Gosheim Lathe centre, now one of Germany’s leading quality and innovation points for this technology, developed by Steinbeis, is a case in point (Semlinger, 1993). Also, the speed with which the model projects for collaborative R&D by *Mittelstand* firms to engage in innovation were set up by the Ministry of Economics, was impressive. But, perhaps implementation in these new and sensitive areas is more difficult than it was for training support or technology transfer in the past. There is a feeling that collaboration in innovation needs longer to develop because it is so close to the heart of the firm’s existence, in its know-how. The sensitivity regarding co-operation in this new area, as compared with older ones such as training, concerns the question of proprietary knowledge. Just as *Mittelstand* firms prefer not to merge because of the fear of losing their know-how, they are understandably unwilling to share their proprietary knowledge with a potential competitor. The Land Ministry of Economics has introduced the idea of ‘model-projects’ where a third-party such as a Fraunhofer Institute acts as the honest broker amongst such firms. Information exchange through the Institute protects individual firm know-how but enables diffusion of the gains from confidentially-pooled knowledge to take place to each member of the model-project.

Finally, what of the firms themselves? What – beyond the initiative taken by the government and intermediaries – have machine tool firms been doing to improve competitive performance?

- **Lean Production**, as a message and possible model, has been absorbed and, in some cases acted upon. Market-leaders have been as likely as sub-contractors to engage in this. Investment in in-house stock control and logistics systems, better customer-interaction and above-all, cost-control has begun, though implementation can take up to a year and a half, which is too long;

- **Value Engineering**: This cost-management system, involving clocking-in each time a different (and differently-skilled) worker conducts a task in the production process is being installed, again slowly. Waste in production time and organisation is thus being reduced;

- **Simultaneous Engineering**: Normally considered a large-firm response to the requirements of ‘permanent innovation’, this approach has been instituted by a group of Baden-Württemberg firms engaged in the measurement industry in the Albstadt area of Schwarzwald (Gassmann et al, 1993).

### 4. CONCLUSIONS AND

It has been argued that the mac faces very serious problems of summed up in six key production; skills; the environ awareness that these and related cases action is being taken, but suggested, a tendency to u intermediary institutions in t individually they look similar Germany, in harness they act consensus for action. This ma modernisation and assisting a because it creates a monitoring an age of permanent innovation

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Costs of production are a sec on machine tool competitiveness. F points and action conditions in Mettler-Toledo, are in the foref systematic management tool fi minimising waste and maximising Ministry programmes of incenti known as concurrent) engineer increasing worker flexibility and direction. The IG Metall study of
4. CONCLUSIONS AND ASSESSMENTS

It has been argued that the machine tool industry in Baden-Württemberg faces very serious problems of competitiveness. These problems can be summed up in six key dimensions: Japanese competition; costs; lean production; skills; the environment; and innovation capacity. There is awareness that these and related or subsidiary problems exist and in some cases action is being taken, but not in all dimensions. There is, it has been suggested, a tendency to under-estimate the importance of the intermediary institutions in the Land. While, on the surface and individually they look similar to intermediary institutions elsewhere in Germany, in harness they act efficiently and effectively to mobilise consensus for action. This may be the most vital asset for promoting modernisation and assisting \textit{Mittelstand} firms to cope with change because it creates a monitoring and learning environment and culture. In an age of permanent innovation, this is of crucial importance.

However, the first threat noted was that of Japanese and other Asian country competition. Not least, the fact that price competition has reached high-end markets, especially the German domestic market, has given Baden-Württemberg’s machine tool producers cause for concern. Japanese imports now account for 25 per cent of the German market for CNC turning machine tools. Japanese firms are both quicker and 30 per cent cheaper, offer higher quality and good service (Ministry of Economics, 1993). The Ministry view, expressed in its publication \textit{Gemeinschaftsinitiative Wirtschaft und Politik} is that the structural problem of Japanese competition is survivable due to Baden-Württemberg’s high quality production and technological know-how. But, there is a need to reduce costs and compensate for the lack of investment in the boom years. Control technology is a crucial weakness. The only way forward is for Baden-Württemberg firms to co-operate on the development of generic, modularised systems, components and parts. In this way, scale benefits can be achieved without the diseconomies of merger (as testified by the Deckel-MAHO case).

Costs of production are a second and crucial factor in the decline of machine tool competitiveness. Firms find themselves at different starting points and action conditions in relation to this. Some, like Getrag and Mettler-Toledo, are in the forefront now. Lean production is precisely a systematic management tool for taking cost out of production by minimising waste and maximising value-adding activity. The Economics Ministry programmes of incentives for projects on simultaneous (also known as concurrent) engineering and lean production (especially increasing worker flexibility and responsibility) are a move in the right direction. The IG Metall study of Mettler-Toledo, the Albstadt measuring...
machinery firm shows how moving away from accountant-led purchasing (resulting in huge stocks – 50 per cent of turnover), unsatisfied customers and half-processed products being scrapped, resulted in increased productivity. This was because of cost-targeting, project-based management, worker participation and a market rather than a production focus. As a result, turnover is now DM100 million, stocks are DM4-5 million, or 4-5 per cent of turnover). Average product development time is now less than six months, while it was over two years. Some 30 per cent of turnover goes towards developing new products; 15-18 are in development. Manufacturing depth has been reduced to 40 per cent, below the industry average of 42 per cent. The firm is in credit, has been profit making since 1989 and productivity has increased greatly (Gassmann et al, 1993).

If lean production reduces production costs, what about the impact upon skills, work organisation and worker participation? Too many Mittelstand firms are, despite the mythology, more hierarchical, less open or transparent, have less frequent consultation and a weaker information flow than their Japanese competitors. The skill division of labour and power of the Meister reinforce the hierarchical tendency and undermine the requirement for meeting new demands of flexibility and multi-skilling. Once again, the Mettler-Toledo example points the way forward. The cornerstones of the new policy towards the production process are:

- Self-management;
- Individual responsibility – based on information;
- Integrated functions – no more Taylorism;
- Open communication;
- Organisation based on trust.

Each worker should be able to conduct many more work tasks. Teams of workers should work on simultaneous product development instead of being compartmentalised. Employees’ desire to work well should be capitalised upon by recognition of the fact that people are the only source of creativity. In return, flexi-time and working elasticity can be achieved.

Next, innovation, the most crucial competitive weapon, needs a significant overhaul in the Baden-Württemberg machine tool industry. We have seen how the Japanese alone make sophisticated control systems, meaning that if firms do not co-operate to develop modular systems, more and more German machines will be fitted with Japanese control technology and a great deal of know-how will flow from Germany to Japan. Other recommended pre-competitive R&D, concern:

- Mechanical synergies;
- High-speed manufacture;
- Design-for-manufacture a
- Graphic-interactive progr;
- Use of micro-electronics

A recent survey by Felder and Ne about Baden-Württemberg macl Expenditure on R&D is less than i to small firm size. Informal in
Radically improved products acco of turnover from improved prod became smaller. Turnover from ov engineering businesses and labour of simultaneous engineering mean of new knowledge rather than technology transfer sources. Purct gaining know-how and more form Clearly, there is much room for im

Finally, what does the Baden-V opportunities and limits of netw well-endowed region, especially in Max Planck Institutes, 14 Fraunho universities. Moreover, it has 39 f whole ‘economy culture’ of the regi circumstances, it is possible to have technology-transfer for SMEs, Foundation. This organisation was only 7 per cent of its funding comes either comes from market transacti public sector (e.g. evaluating pr funding) or for firms using publi consultancy. The network consists o usually in the Polytechnics. Indi accredited by Steinbeis to act as te directed by Steinbeis to the appro takes a fee. This policy is difficult t many countries lack the rich inn Baden-Württemberg.
from accountant-led purchasing) unsatisfied customers pped, resulted in increased cost-targeting, project-based arket rather than a production 0 million, stocks are DM4-5 ge product development time over two years. Some 30 per ; new products; 15-18 are in een reduced to 40 per cent. The firm is in credit, has been ivity has increased greatly

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- Mechanical synergies;
- High-speed manufacture;
- Design-for-manufacture and value for money;
- Graphic-interactive programming systems;
- Use of micro-electronics and micro-mechanics.

A recent survey by Felder and Nerlinger (1994) concludes the following about Baden-Württemberg machine tool firms’ innovation capacity. Expenditure on R&D is less than in other engineering sectors, partly due to small firm size. Informal innovation activity tends to be higher. Radically improved products accounted for a relatively small proportion of turnover from improved products since 1990, especially as firms became smaller. Turnover from overseas was very low compared to other engineering businesses and labour productivity was also lower. The lack of simultaneous engineering meant that customers were the main source of new knowledge rather than production, logistics, research or technology transfer sources. Purchase of equipment is the main way of gaining know-how and more formal methods are not very pronounced. Clearly, there is much room for improvement.

Finally, what does the Baden-Württemberg case tell us about the opportunities and limits of networking? First, it is an exceptionally well-endowed region, especially in terms of research institutions with 14 Max Planck Institutes, 14 Fraunhofer Institutes and 9 international-class universities. Moreover, it has 39 Fachhochschulen (Polytechnics). The whole ‘economy culture’ of the region is ‘high road’ in mentality. In such circumstances, it is possible to have a diffused, network-based system of technology-transfer for SMEs, as happens through the Steinbeis Foundation. This organisation was set up by the Land government but only 7 per cent of its funding comes from direct public funding. The rest either comes from market transactions or through contract work for the public sector (e.g. evaluating proposals from firms for innovation funding) or for firms using public technology grants for technical consultancy. The network consists of over 100 Technology Centres based usually in the Polytechnics. Individual scientists or engineers are accredited by Steinbeis to act as technical consultants to firms who are directed by Steinbeis to the appropriate consultant. For this, Steinbeis takes a fee. This policy is difficult to transfer because most regions and many countries lack the rich innovation infrastructure enjoyed by Baden-Württemberg.
A further point concerning collaboration is that, as was noted in connection with the 'model-project' idea – whereby SMEs seeking or being required by larger customer-firms to become innovative suppliers are encouraged by Ministry of Economics policy to collaborate – it is not a simple matter to do so. Innovation, in particular, is a sensitive process in which even firms disposed to collaborate must guard their proprietary knowledge. Where there is a rich and trusted intermediary organisation with appropriate expertise, such as a Fraunhofer Institute, that problem may be overcome. But such an institution needs to have earned the respect of the business community and governance system for it to be a feasible option.

Because of the relatively recent implementation of the model projects, it is too early yet to judge their success. By 1994, it was reported that progress was quite slow but efforts to meet the exacting innovation requirements of out-sourcing customer-firms like Mercedes and Bosch were continuing and there remained a desire amongst all parties to succeed. The example of the Gosheim lathe centre is now evaluated as a complete success in that the centre exists and serves the innovation needs of firms in the lathe industry in Germany as well as those in Baden-Württemberg. The involvement of Steinbeis in its establishment is a little unusual in that the Foundation normally deals with requests for technology-transfer from single firms. In this case, it was a request for assistance to establish a systemic innovation facility by a group of firms for an industry.

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**DENMARK: BUILD CLUSTERS IN ISOL**

1. **INTRODUCTION**

With a population of 5.1 million Baden-Württemberg, it is not sur of both large, research-based firm Research by the European Comm introduce micro-electronics equi to catch up in the 1980s, there were shortages. However, Denmark country in terms of GDP per hea can generate communication a its system of SMEs.

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<td>Population (1991)</td>
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<td>Labour Force Participation Rate (1991)</td>
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<td>Employment in Agriculture</td>
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<td>Services</td>
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<td>GDP Per Capita (1991)</td>
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<tr>
<td>GDP Per Employee</td>
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<td>Unemployment Rate (1993)</td>
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**Source:** Eurostat.
CHAPTER 4

DENMARK: BUILDING NETWORKS AND CLUSTERS IN ISOLATED RURAL SETTINGS

1. INTRODUCTION

With a population of 5.1 million (Table 4.1), approximately half that of Baden-Württemberg, it is not surprising that Denmark has a relative lack of both large, research-based firms and a government technology policy. Research by the European Commission shows that Denmark was slow to introduce micro-electronics equipment and that when efforts were made to catch up in the 1980s, there were organisational inadequacies and skills shortages. However, Denmark is the EC’s second most prosperous country in terms of GDP per head. Because of Denmark’s small stature, it can generate communication and interaction economies, especially in its system of SMEs.

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<th>Table 4.1</th>
<th>Denmark Economic Indicators</th>
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<tr>
<td>Population (1991)</td>
<td>5.1 million</td>
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<tr>
<td>Labour Force Participation Rate (1991)</td>
<td>56.3%</td>
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<tr>
<td>Labour Force (1991)</td>
<td>2.9 million</td>
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<tr>
<td>Employment in Agriculture</td>
<td>5.8%</td>
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<tr>
<td>Industry</td>
<td>27.1%</td>
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<tr>
<td>Services</td>
<td>67.1%</td>
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<tr>
<td>GDP Per Capita (1991)</td>
<td>109%</td>
</tr>
<tr>
<td>GDP Per Employee</td>
<td>84%</td>
</tr>
<tr>
<td>Unemployment Rate (1993)</td>
<td>8.0%</td>
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Source: Eurostat.
Of key importance to this system are the support infrastructures for small business. The most important of these are: the Chambers of Commerce and Industry; local and regional technical schools; local and regional banks providing long-term loans for local SMEs; and the Danish Technological Institute with its 15 Technology Centres. The Danish Technological Institute (DTI) is a privatised branch of the Ministry of Industry. It employs 1,200 technologists and others in developing, identifying and transferring generic technologies, largely to SMEs. Some 55 per cent of DTI’s contract income is from firms employing less than 50 people.

Recognising that isolation from information and know-how was a handicap to SMEs, DTI in 1989 established a ‘Network Programme’ which channelled government support to firms willing to co-operate in certain business activities. In one small town in Jutland, the following case-history is instructive. Seven small furniture makers found local markets shrinking. With the aid of a DTI broker they took advantage of the Network Programme. Their discussions led to them agreeing to create a trading company. Through the trading company, they divided up key tasks, so that, for example, design for all firms is done by two designers. Each firm specialises in a particular production phase and the company now exports high-quality furniture to the EC and beyond.

By 1992, 175 networks had been created, in which 42 per cent of firms had increased turnover by 4 per cent or more, and one in five showed increases of 10 per cent or more. Of key importance to the success of this programme was the appointment by DTI of ‘Network Brokers’. These are local professionals, lawyers, consultants or engineers whose job it is to create networks of firms, occasionally supported, as appropriate, by colleges, local authorities, enterprise agencies and so on for consultancy advice, training or business information. These networks then bid for grants from technology programmes aimed at product and process innovation, quality improvement, product differentiation, and very importantly, design, which is seen as a key selling point. These networks maintain the philosophy that ‘The Competitive Advantage of Regions is Achieved through the Competitive Advantage of Firms’.

2. DENMARK AS A LEARNING ECONOMY

Denmark spends a relatively low proportion of its GDP on R&D. In 1991, it was 1.7 per cent compared to a 1987 figure of 1.4 per cent. The 1991 figure is not massively larger than, for example, Ireland’s, which was then 1.1 per cent, later to rise to 1.2 per cent by 1993. This feature was noted in the ‘Archipelago Europe’ study of Denmark by the European Commission DG-12 FAST pro

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el (1991). Hansen’s study show expenditure is a result of particu

This is associated with the Dani usually dominated by small company alone accounted for 9 sector R&D expenditure in 1988 than six employees were engag

R&D expenditure should not be much more concerned with the generation of new knowledge progress, though in the early showed Danish firms lagging micro-electronics, in industry... sector was held to be responsi

The following observation, t compensate for its structural dis

There are also some strong innovation, however. In st communication and interna

between firms making inte seems as if cultural distance participating in innovation results indicate that there is a system of innovation to cor large, research based firms; through communication and of small and medium-sized (Johnson et al, 1991).

This view underpins a considerable into policies to support small fir decade or so. In other words, wh it makes up for by searching anc elsewhere into innovations, rathe

The notion of a ‘learning economy’ and Johnson (1994), and it repa relevance in the context of s economies. The authors note at t of micro-electronics to Denmar interactive learning and new cc process of economic change. Th
Commission DG-12 FAST programme in Hansen (1991). The question is further explored, from a systematic learning perspective by Johnson et al (1991). Hansen’s study shows that Denmark’s relatively low research expenditure is a result of particularly low expenditure in the private sector. This is associated with the Danish firm-size structure, which is more than usually dominated by small and medium enterprises. Indeed, one company alone accounted for 9 per cent of total and 18 per cent of private sector R&D expenditure in 1989. Only some 8 per cent of firms with more than six employees were engaged in R&D in the same year.

R&D expenditure should not be confused with innovation. The latter is much more concerned with the commercialisation rather than the generation of new knowledge. Here, the Danes have made steady progress, though in the early 1980s this was less the case. Research showed Danish firms lagging in their absorption of, for example, micro-electronics, in industry. Again, the dominance of the small-firm sector was held to be responsible (Hansen, 1991; Johnson et al, 1991). The following observation, though, indicates how Denmark may compensate for its structural disabilities:

There are also some strengths in the Danish national system of innovation, however. In some respects it is characterised by communication and interaction economies both within and between firms making interactive learning rather effective. It seems as if cultural distances between different kinds of people participating in innovation activities are often quite short. The results indicate that there may be some possibilities in a national system of innovation to compensate for a relative lack of both large, research based firms and government technology policy, through communication and interaction economies in a system of small and medium-sized firms. At least for a period of time (Johnson et al, 1991).

This view underpins a considerable amount of the thinking that has gone into policies to support small firm development in Denmark in the past decade or so. In other words, what Denmark lacks in capacity to invent, it makes up for by searching and learning to transform inventions from elsewhere into innovations, rather as Japan has done.

The notion of a ‘learning economy’ has been elaborated upon by Lundvall and Johnson (1994), and it repays close analysis because of its general relevance in the context of smaller, SME-dominated, peripheral economies. The authors note at the outset how the belated introduction of micro-electronics to Denmark convinced them of the central role interactive learning and new combinations of knowledge play in the process of economic change. The recent development of Information &
Communication Technologies (ICT), the rise (especially from Italy) of flexible specialisation and changes in the process of innovation have promoted knowledge-intensity and learning to the front rank of assets or resources for contemporary competitive advantage. Incremental innovation has become necessary for the survival of firms, requiring many learning interfaces inside and outside firms. Users are crucial sources of innovative knowledge and learning. Meanwhile research costs continue to escalate and product life-cycles shorten, so payback time is reduced.

As a consequence, innovation processes must be capable of rapid-response, multi-skilling and networking skills increase in importance and application of learning becomes a crucial part of overall firm performance. Management increasingly becomes a matter of creating the institutional setting (rules, routines, habits) for stimulating interactive learning. Thus, advanced economies are learning economies. In a learning economy, networking amongst firms, horizontal communication and frequent mobility of persons between departmental posts are typical features of associated ‘learning organisations’. There is a tendency for economies to specialise according to their excellence along specific sectoral learning curves. A case in point would be the Italian industrial districts. But although learning occurs by monitoring internal organisational performance in relation to goals, a large part of economic learning comes from overseas. The relationship between ‘tutor’ and ‘learner’ economies is a complex one.

In learning economies, learning and tutoring are going on at mundane levels as well as within science and technology. An example from Denmark is quoted by Lundvall and Johnson (1994) to show what they mean by this. A thirty-employee firm from Jutland producing furniture introduced a new work-bench for electronics repairs. It was successful, not least because it was made from dust-repellent material which also prevented static build-up. It originated from a discussion at a trade-fair. Representatives of the service department of a large Danish consumer electronics firm were there seeking such a work-bench. The small firm contacted a design firm and set up a project-group. They discovered they needed experts in materials, so they contacted the Danish Technological Institute (DTI) and a prototype was constructed, tested and marketed. The whole process took one year and is representative of a user-driven interactive learning and incremental innovation system in a rather mundane product area.

Policy, conclude Lundvall and Johnson (1994) can assist such processes. First, the existence of the technology transfer institute DTI is itself a product of government, even though it is now privatised. But policy can also fit the kind of trajectories that knowledge frequently evolves along, by stimulating progress further all are referred to as ‘path-dependent’. The Network Programme, to be described, has developed a prototype, state-such an innovation grows from the fishing and trawler-building and has enabled this network of firms to gain advantage in a traditional industry respect to radiotelephony in Dent policies have traditionally operated policies have been less successful in encouraging firms to shift from one industry to another.

Policy can be useful in helping to diversify too. ‘Lock-in’ is the done innovation system is still producing work in an industry or branch anachronistic (hot metal versus Environmental regulation is pol innovating, notably the Danish which stimulated Denmark’s work importantly, policy and govern institutional infrastructure in which itself, understanding and acting u and society (including its own). F discouraging firms from pursuing objectives. If an industry or activi businesses to graduate to a better innovation which Johnson (1992) i

3. DANISH ENTERPRISE INITIATIVES

Because of its relative backwardness technologies, the Danish government in the 1980s. Much of this was inev the National Agency of Techn infrastructure. Grants for projects to over 1,000 firms and a further firms. £20 million was invested in equipment alone and a technolo graduates to study abroad. The Innovation Centres (TICs) and a further been scattered throughout the cour
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by stimulating progress further along such trajectories, or what elsewhere
are referred to as ‘path-dependencies’ (Arthur, 1994). For example, under
the Network Programme, to be described, a group of SMEs in Aalborg
have developed a prototype, state-of-the-art, ‘intelligent trawler’. Clearly,
such an innovation grows from the region’s traditional involvement in the
fishing and trawler-building and equipping industries. However, policy
has enabled this network of firms to gain competitive innovation
advantage in a traditional industry. A comparable example occurs with
respect to radiotelephony in Denmark in Section 5(iii) below. Industrial
policies have traditionally operated in such a way. Where industrial
policies have been less successful, though still important, is in
couraging firms to shift from one trajectory to another.

Policy can be useful in helping to stimulate and safeguard institutional
diversity too. ‘Lock-in’ is the downside of path-dependency, where an
innovation system is still producing, for example, trained technicians to
work in an industry or branch which is becoming technologically
anachronistic (hot metal versus desktop publishing, for instance).
Environmental regulation is policy which creates opportunities for
innovating, notably the Danish alternative energy regulations in the 1970s
which stimulated Denmark’s world-leading in wind power technology. Most
importantly, policy and government administration can become the
institutional infrastructure in which a learning economy is embedded by,
its own, understanding and acting upon system linkages within economy
and society (including its own). Finally, government can have a role in
discouraging firms from pursuing obsolete or unrealistic economic
objectives. If an industry or activity is uncompetitive, it can encourage
businesses to graduate to a better one. This is the ‘forgetting’ aspect of
innovation which Johnson (1992) in particular is associated with.

3. DANISH ENTERPRISE AND INNOVATION SUPPORT INITIATIVES

Because of its relative backwardness in picking-up on micro-electronics
technologies, the Danish government had a big push on technology policy
in the 1980s. Much of this was inevitably directed at small firms. In 1987,
the National Agency of Technology spent some £30 million on
infrastructure. Grants for product and process innovation were awarded
to over 1,000 firms and a further 700 went to joint solution teams and
firms. £20 million was invested in Advanced Technology Centres for
equipment alone and a technology scholarship programme enabled
graduates to study abroad. The DTI had established 15 Technical
Innovation Centres (TICs) and a further 82 local technology centres had
been scattered throughout the country. Added to this, a large number of
private consultants also supported Denmark’s approximately 7,000 SME manufacturers. This ‘shotgun’ approach was criticised for being strong on the inputs and grants side but less concerned about the outputs and performance side. With a change of minister in 1990 many of these support programmes were abolished and the DTI itself privatised.

In 1989, the Ministry of Industry and Trade established a plan of action to introduce network co-operation amongst firms in Denmark. It was to be a three-year programme with a budget of some £20 million, project-managed by the soon-to-be-privatised Danish Technological Institute. The programme was modelled on a stylised picture of the Emilia-Romagna network model of production based on sub-contracting and partnership in industrial districts. Of course, the latter ‘model’ grew organically without any specific initial design, though later, elements of enterprise support were added, as we have seen. The stylised picture had been presented by the American consultant Richard Hatch (Hatch, 1988), and the Danish Ministry adopted it. The basic idea was to seek to help Danish SMEs overcome the isolation often inherent in small firms and, through networking, to encourage innovation and competitiveness.

The key elements in support of the programme were grants (to pay brokers and consultants to advise on business action plans), network brokers, and centres from which the programme could be run in the field. The role of the specially trained brokers was to create networks of firms willing, with grant-incentive, to co-operate on any aspect of improving their businesses jointly – from technology to marketing. Forty brokers were recruited to work in the programme and they were given a nine-month training programme to gain accreditation. Each broker was required to commit 25 per cent of working time to the programme and also to pay for a series of seven two-day training sessions at a cost of some £3,000. Most brokers were consultants, some were employees of Advanced Technology Centres.

Rather, as in Emilia-Romagna, where businesses expressed criticism of public enterprise support policies which appeared to encroach upon private-sector consultancy or Chamber of Commerce territory, so in Denmark there was hostility to the Network Programme. Business associations were unhappy about competition, but also about co-operation, which they thought undermined entrepreneurship. Some objectives were antagonistic to the giving of grants for such purposes. Nevertheless, the programme went ahead buoyed by the publicity, both positive and negative, that it had engendered. The phasing of the grant arrangements was as follows: first phase (£2 million) for networks of at least three firms and two kinds of co-operation to be designed; second phase (£3.5 million) for development of fruitful ideas; and third phase (£10 million) to implement a small (e.g. a new kind of fishing boat in .

Some 3,000 firms became involved (Rosenfeld, 1990). Much of the many firms in the programme go initiative. Their role is as important of the Steinbeis Foundation in Bade centres in Emilia-Romagna (Pyke, and functions of DTI repay the eff of successful, modern, enterprise su

4. THE DANISH TECHNOLO

It dates from 1906 and employs 1,250 in two centres at Copenhagen (Tast private foundation, run on a for consultancies and other service pro action lines:

- Applied research;
- Technological problem-solv
- Quality, materials and enviro
- Management and organisatio
- Provision of training and cou
- Management and engineering
- Information provision.

DTI is the leading technology transfe function as a technical training agency than 10 per cent of its activity is in thi for DTI activity at lower cost.

DTI is structured operationally into th

- Sectorally Specialised D. construction, textiles and clot
- Technologically Specialised E. grouped technologies, especi
computing, bio-technology, ne
- Human Resource Departme organisational matters.
anism’s approximately 7,000 SMEs which was criticised for being strongly concerned about the outputs and the minister in 1990 many of these and the DTI itself privatised.

Trade established a plan of action amongst firms in Denmark. It was to a budget of some £20 million, privatised Danish Technological Institute on a stylised picture of the production based on sub-contracting. Of course, the latter ‘model’ grew I design, though later, elements of have seen. The stylised picture had been Richard Hatch (Hatch, 1988), the basic idea was to seek to help often inherent in small firms and, innovation and competitiveness.

Programme were grants (to pay brokers action plans), network brokers, anduld be run in the field. The role of networks of firms willing, with respect of improving their businesses. Forty brokers were recruited to be given a nine-month training, the broker was required to commit 25 h per week and also to pay for a series of courses of some £3,000. Most brokers were of Advanced Technology businesses expressed criticism of rich appeared to encroach upon er of Commerce territory, so in Network Programme. Business competition, but also about ermining entrepreneurship. Some £500,000 of grants for such purposes. had buoyed by the publicity, both surprised. The phasing of the grant was (£2 million) for networks of at operation to be designed; second of fruitful ideas; and third phase (£10 million) to implement a small number of the most advanced ideas (e.g. a new kind of fishing boat in Aalborg).

Some 3,000 firms became involved in the programme during its first year (Rosenfeld, 1990). Much of the credit for the success of involving so many firms in the programme goes to the DTI, the managers of the initiative. Their role is as important to SME support in Denmark as that of the Steinbeis Foundation in Baden-Württemberg, or the Real Services centres in Emilia-Romagna (Pyke, 1993). Examination of the structure and functions of DTI repays the effort in terms of defining key activities of successful, modern, enterprise support systems.

4. THE DANISH TECHNOLOGICAL INSTITUTE

It dates from 1906 and employs 1,250 people in many locations but mainly in two centres at Copenhagen (Tastrup) and Aarhus (in Jutland). It is a private foundation, run on a for-profit basis in competition with consultancies and other service providers. DTI has the following main action lines:

- Applied research;
- Technological problem-solving;
- Quality, materials and environmental testing;
- Management and organisational consultancy;
- Provision of training and courses;
- Management and engineering training;
- Information provision.

DTI is the leading technology transfer agency in Denmark. Its founding function as a technical training agency has declined such that, today, less than 10 per cent of its activity is in this sphere. Colleges have substituted for DTI activity at lower cost.

DTI is structured operationally into three divisions:

- Sectorally Specialised Departments: e.g. emphasising construction, textiles and clothing, wood and furniture etc.;
- Technologically Specialised Departments: emphasising single or grouped technologies, especially those of a generic nature, e.g. computing, bio-technology, new materials etc.;
- Human Resource Departments: emphasising managerial or organisational matters.
Apart from the textiles and clothing department, centred at Herning-Ikast in rural Jutland, the rest are concentrated at Copenhagen or Aarhus. Some small, generalist branches (e.g. business management) are distributed regionally as are the government-subsidised TICs (Technological Information Centres). These are forerunners of the UK Business Link and Business Connect network centres acting as access points for SME enterprise support.

DTI is dependent on SMEs for its income, so it has an interest in continually improving services to that sector. In 1990, 36 per cent of income came from firms with less than 10 employees, 30 per cent from those with between 10 and 50, the remainder from those employing over 50. The average invoice is for £3,000. With privatisation and a decline in government support for grant-giving and subsidy more generally, DTI’s target market has not been growing. This is one reason why DTI placed so much effort in promoting, as successfully as possible, the Network Co-Operation Programme.

To return to the Network Programme, it will be recalled that some 3,000 firms became involved, although by 1992 the numbers had settled down to around 1,000 firms in about 200 networks. Meanwhile, some 500 firms have established around 100 networks without government-funding. Each network has, as the numbers suggest, an average of five firms in it. Small-firm co-operation was seen by government and DTI as necessary if they were to be able to afford DTI’s relatively advanced and sophisticated technological services. The development of a programme supporting Experience Exchange Groups was an element of this strategy of network-building, too. The Experience Exchange Groups are a bottom-up mechanism whereby SME entrepreneurs express needs and experiences assisted by a consultant facilitator who animates discussion amongst firms in the groups. Co-operation may be a solution to problems raised.

The Ministry of Industry deployed a staff of three to work on the programme, liaising with DTI as programme-managers. In turn, they were advised by a twelve-member consultancy group, drawn from the social partners, whose job was to establish consensus in conducting the programme. As we have seen, there was not complete consensus as to the desirability or viability of the programme.

Amongst the key features of the programme were, as noted earlier:

- The network brokers – facilitators of networks, advising on aspects of co-operation, identifying opportunities, bringing firms together and catalysing discussions.
- Financial Subsidies – necess. naturally receptive to collaborate to see the benefits of co-operation took place, it was between 1 competing areas.
- Centres from which to organise and regional technology centres system of meeting and conferences programme.

Admission to the scheme was on th form new, legal Network Co-Op; participants (must be at least three) preferred, but not obligatory, as a selection of applicants included: exps a good size-distribution amongst firm viability; and good representation Broker-training was, as noted earlier cent only actually became brokers generated over 100 networks. Net identify possible networks, provide appropriate networks. Legal and tax; up standard co-operation contracts.

firms involved: (1) Feasibility Study per cent of costs up to a maximum c Phase (50 per cent of costs for first ye (50 per cent of costs for first year, 2 payment was some £12,000).

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amme were, as noted earlier: initiators of networks, advising on ying opportunities, bringing firms sions

- Financial Subsidies – necessary to induce Danish firms, no more naturally receptive to collaboration than firms in most countries, to see the benefits of co-operation. Notably where co-operation took place, it was between firms in complementary rather than competing areas;
- Centres from which to organise networks – the network of local and regional technology centres was valuable as a decentralised system of meeting and contact points for the running of the programme.

Admission to the scheme was on the basis that firms were prepared to form new, legal Network Co-Operation Companies, legally binding participants (must be at least three) to work the agreement. This was preferred, but not obligatory, as a modus operandi. Criteria used for selection of applicants included: export-potential; employment potential; a good size-distribution amongst firms in networks or potential networks; viability; and good representation from a wide range of industries. Broker-training was, as noted earlier, at a cost to brokers; around 50 per cent only actually became brokers but these trained brokers actually generated over 100 networks. Network scouts were also trained, to identify possible networks, provide information and even link firms to appropriate networks. Legal and taxation expertise was on hand to draw up standard co-operation contracts. The three phases of the scheme for firms involved: (1) Feasibility Study and Production of Action Plan (100 per cent of costs up to a maximum of £6,500); (2) Planning and Set-Up Phase (50 per cent of costs for first year up to £8,000); (3) Running Stage (50 per cent of costs for first year, 30 per cent in the second – average payment was some £12,000).

Despite the tendency for co-operation to be based on complementary rather than competing markets, some co-operative networks developed amongst competitors. This occurred especially where network firms could agree in which markets they would compete and co-operate. So competitors might co-operate to design a particular product or product collection (e.g. furniture or clothing), but compete on other products. Firms might compete on the home market but co-operate on export markets. Finally, competitors could and did co-operate on joint purchasing, especially for special equipment useful to all.

Nevertheless, some competitors who sought to co-operate failed to do so. One group of eight small engineering firms sought co-operation to win large orders from large firms such as Volvo and Bosch. One reason for their failure to do so was that one firm in the ‘network’ was reluctant to share a significant established customer with the rest of the group. Equally, that customer objected to the whole group supplying his
competitor abroad but not him. The firms in question also failed to achieve the objective of establishing a common, computerised information system. Thus, despite incentives, co-operation in networks was by no means always secured by means of the Network Programme. A sector which proved relatively cool on co-operation was textiles and clothing, based in the industrial district of Herning-Ikast.

5. EVALUATION OF THE NETWORK PROGRAMME

The Network Programme attracted applications for funding according to the sectors listed in Table 4.2 and by size distribution of firms as revealed in Table 4.3.

This table shows that the network programme was mainly of interest to traditional industry sectors, including primary industry.

**TABLE 4.2**

<table>
<thead>
<tr>
<th>Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming, Forestry, Fishing</td>
<td>10</td>
</tr>
<tr>
<td>Food, Beverages, Tobacco</td>
<td>6</td>
</tr>
<tr>
<td>Textiles, Clothing</td>
<td>3</td>
</tr>
<tr>
<td>Wood and Furniture</td>
<td>11</td>
</tr>
<tr>
<td>Graphics Industry</td>
<td>7</td>
</tr>
<tr>
<td>Iron and Metals</td>
<td>25</td>
</tr>
<tr>
<td>Plant and Equipment</td>
<td>10</td>
</tr>
<tr>
<td>Trade, Hotels</td>
<td>6</td>
</tr>
<tr>
<td>Transport</td>
<td>4</td>
</tr>
<tr>
<td>Others</td>
<td>18</td>
</tr>
</tbody>
</table>

**Source:** Danish Ministry of Industry.

In 1991, an evaluation of the program Knop (1991) on behalf of the Nation an agency of the Ministry of Industry, evaluation was that 40 per cent of f firms programme ascribed at least 4 percent to the fact that they had been a memb Network Programme. Furthermore, increase in sales of more than 10 per c of course we must remember the 60 p their performance to being in network than 4 per cent increase in sales. N respondents thought that the network international competitive power (Gels 93 per cent of the networks reported st to the programme.

The most frequently mentioned objec mentioned by 71 per cent of Phase 2 3. Product development was noted in networks, but exploitation of new pro by only 7 per cent. Some 29 per cent cent because of failure to reach a fort reasons other than grant-related questi the failure to achieve Phase 3 grants after per cent replied in the negative. In res per cent said marketing had been st
ns in question also failed to achieve
mon, computerised information
operation in networks was by no
he Network Programme. A sector
operation was textiles and clothing,
ng-Ikast.

WORK PROGRAMME
lications for funding according to
ze distribution of firms as revealed
gramme was mainly of interest to
primary industry.

4.2
ing Applications by Sector

| %  |  
|----|---|
| 10 |  
| 6  |  
| 3  |  
| 11 |  
| 7  |  
| 25 |  
| 10 |  
| 6  |  
| 4  |  
| 18 |  

<table>
<thead>
<tr>
<th>Employees</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>21</td>
</tr>
<tr>
<td>6-9</td>
<td>11</td>
</tr>
<tr>
<td>10-19</td>
<td>20</td>
</tr>
<tr>
<td>20-49</td>
<td>25</td>
</tr>
<tr>
<td>50-99</td>
<td>12</td>
</tr>
<tr>
<td>100-199</td>
<td>5</td>
</tr>
<tr>
<td>200+</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Danish Ministry of Industry.

In 1991, an evaluation of the programme was carried out by Gelsing &
Knop (1991) on behalf of the National Agency for Industry and Trade, an
agency of the Ministry of Industry. The key empirical finding of this
evaluation was that 40 per cent of firms that had reached Phase 3 of the
programme ascribed at least 4 percentage points of their increase in sales
to the fact that they had been a member of a network established by the
Network Programme. Furthermore, more than 20 per cent ascribed an
increase in sales of more than 10 per cent to involvement in their network.
Of course we must remember the 60 per cent of firms who did not ascribe
their performance to being in networks, or if they did, it resulted in a less
than 4 per cent increase in sales. Nevertheless, 75 per cent of survey
respondents thought that the network co-operation had strengthened their
international competitive power (Gelsing & Knop, 1991, p.11). Moreover
93 per cent of the networks reported some increase in turnover ascribable
to the programme.

The most frequently mentioned objective of the network was marketing,
mentioned by 71 per cent of Phase 2 networks and 58 per cent of Phase
3. Product development was noted as an objective of 40 per cent of
networks, but exploitation of new production equipment was mentioned
by only 7 per cent. Some 29 per cent of networks had dissolved, 24 per
cent because of failure to reach a formal co-operation stage, mostly for
reasons other than grant-related questions. In other words, when asked if
the failure to achieve Phase 3 grants caused the failure of the network, 18
per cent replied in the negative. In respect of network achievements, 64
per cent said marketing had been strengthened as a consequence of


networks, while 70 per cent indicated that product development had been strengthened. Organisational improvement was mentioned by 33 per cent and improved image by 22 per cent.

Some 29 per cent of network partnerships had changed during the development process (71 per cent had remained stable). Gelsing and Knop (1991) note that this illustrates that company co-operation in networks is a development process in which mutual trust must be established and individual as well as common objectives must be clarified. The main reason for change is that one or several participants cannot achieve their objectives in the co-operation; sometimes it is because of normal trading difficulties of firms (e.g. bankruptcy). Bearing in mind that 93 per cent of networks reported increased turnover from involvement in the programme, the question arises of how many reported actual reductions in costs as a consequence of network participation. Only 15 per cent of networks stated this as an objective, but 19 per cent reported cost reduction as an effect of involvement in the Network Programme.

Finally, as many as 75 per cent of the networks confirmed that network co-operation has strengthened the international competitive power of the participating firms. Of the remainder, 20 per cent could not say whether or not this was the case. This high figure for those reporting higher international profile is considered to be a major achievement of the programme even though it need not mean such a widespread increase in turnover. Many Danish SMEs appear to operate in declining markets though increasing their competitive strength nevertheless. This is a problem of having such a large part of the economy operating in traditional product markets, some of which (e.g. dairy produce) are under threat from changing fashions in food consumption.

(i) Recent Network and Cluster Experiences in Denmark

The Danish Network Programme can be considered a success. One indicator that the idea was good is that at least 100 networks formed in parallel with the official programme but without official subsidies and incentives. Any programme that results in 93 per cent of participants ascribing some degree of increased sales or turnover to it has to be considered a success, especially as 20 per cent ascribed at least a 10 per cent increase in a two-year period. Moreover, the strengthening of presence in foreign markets, actual reductions in costs of doing business for some 20 per cent of networks and the widespread improvement in marketing and image all testify to the accomplishments of the programme in exceeding expectations.

(ii) The Aarhus Growth Groups

The region is dominated by the for cluster-like fashion, including energy technology, electronics and more than 33 per cent of the private sector enterprises. Aarhus municipality launched development initiatives with a view to consensus approach, typical of Danish strategy through public-private deals. Key features of the plan are:

- Growth Groups;
- Innovation Contracts;
- Business Advisory Agency;
- Venture Capital Investment;
- Agri-food Forum;
- International investment local;
- Establishment of Knowledge

Organic networks of firms, banks, purchasers and trade unions were stimulators of information exchange.

The ‘Growth Group’ concept is the business success comes from improve learning supported by professional networks which become growth group. Each group consists of 10 to 15 firms in the innovation process (e.g. product or management, modern marketing, occasions over an eighteen-month period). Individual consultant support; payment
Network thinking informs at least two further advances made by Danish policy support for indigenous enterprise. The first of these is centred on the city of Aarhus which, with neighbouring towns such as Skanderborg, Silkeborg and Randers, comprises an area in north Jutland with a population of some 600,000. The second is centred upon the city of Aalborg, also in North Jutland where a world-class cluster of mobile telephone companies, all of which are local SMEs, has developed.

(ii) The Aarhus Growth Groups Concept

The region is dominated by the food industry but others, related in a cluster-like fashion, include environmental science, bio-technology, energy technology, electronics and software. Food processing accounts for more than 33 per cent of the private sector labour force and over 80 per cent of private sector establishments employ less than 50 persons. In 1991, Aarhus municipality launched Plan 2001 as an economic development initiative with a view to creating 20,000 new jobs. The consensus approach, typical of Danish policy-making, sought to build the strategy through public-private dialogue and public-private interaction. Key features of the plan are:

- Growth Groups;
- Innovation Contracts;
- Business Advisory Agency;
- Venture Capital Investment Company;
- Agri-food Forum;
- International investment location initiative;
- Establishment of Knowledge Centres.

Organic networks of firms, banks, business associations, public sector purchasers and trade unions were stimulated to engage in discussion and information exchange.

The ‘Growth Group’ concept is the most innovative. This stresses that business success comes from improved performance based on continuous learning supported by professional resources. Firms come together in networks which become growth groups by implementing this philosophy. Each group consists of 10 to 15 firms working on an aspect of the business innovation process (e.g. product or process development, total quality management, modern marketing, etc.). Seminars are held on ten occasions over an eighteen-month period. Between seminars, firms have individual consultant support; payment is shared (50:50) between firm
and municipality. The average cost per group is some £100,000. So far, 14 groups have been launched and preliminary assessments suggest average turnover has increased by more than 10 per cent with 200 new jobs having been created. Firms pay £4,000 each to the group and growth group themes range from developing food processing equipment to innovative environmental technology (Huggins, 1995).

Groups enable firms to access each other’s resources and reinforce firm commitment to achieving common realisable innovation objectives. Meeting deadlines reinforces group commitment, there being an informal cultural ‘sanction’ if other priorities are placed higher. One example is CD-Line, a growth group focused on eleven clothing firms. They produce complementary products, one firm specialising in shirts, another in suits, another ladies knitwear and so on. They are joint-marketing their unified product ranges in Germany and Sweden, they share marketing personnel, quality assurance, and paperless trading (EDI) business communications. The group gains contracts the individual firms could not.

(iii) The Radiocommunications Cluster in Aalborg

Denmark’s trade figures display international specialisation in telecommunications, medical electronics and instrumentation. The Danish electronics industry, of which these sectors are the leading segments, employs 24,000 and more than 90 per cent of sales are exports. In mobile phone equipment, Denmark is the sixth most specialised country after Finland, Sweden, Japan, USA and UK. Aalborg has the second most important mobile phone production cluster after Copenhagen, (Dalum, 1995).

The cluster originated in a single firm, SP Radio, from which, after 1946, a further twenty-four either spun-off or were new start-ups linked to the new Aalborg University (established in 1974) and its Science Park. One factor explaining Aalborg’s path-dependency in mobile communications is the existence of a large, commercial fishing fleet representing buyers of radio communications equipment. The strength of Aalborg University in electronic engineering boosted the cluster from the 1980s onwards, during a period when the market for mobile telephony was growing quickly.

The mobile phone equipment companies are both co-operative and competitive, the former locally, the latter globally. However, the success of the cluster has brought change in the form of outside acquisition of firms that were too small to become global players. Thus, Amstrad bought Dancall, a cluster-leader and the Korean firm Maxon bought T-Com while Motorola, Ericsson and Nokia closed down DE Development, a local joint

venture they had funded. Policy, (Aalborg a world-class SME-t Whether it can be sustained as st

6. CONCLUSIONS

The Danish case is of considerable develop competitive advantage accomplished small firm sector Programme was successful in establishment of a large number of firms to improve their sales. Of k following. First, the institutional was managed was well-founded respected body combining bu expertise. Its equivalent in Ireland care was also taken to include ot the programme. Second, the prog a sense of momentum to firms and practice of co-operating, in the fir action plan, to final implementatio Third, the initiative involved hav the network- formation process a intent. These were available to necessary technical consultancy to or in terms of product or prox scepticism of firms towards b management consultancy on the o
venture they had funded. Policy, education and research combined to give Aalborg a world-class SME-based radio-communications cluster. Whether it can be sustained as such remains to be seen.

6. CONCLUSIONS

The Danish case is of considerable relevance to Irish thinking on how to develop competitive advantage by co-operative means in a less accomplished small firm sector. The Danish Network Co-Operation Programme was successful in its own terms, both in assisting the establishment of a large number of small firm networks, and in assisting firms to improve their sales. Of key importance to this success were the following. First, the institutional context within which the programme was managed was well-founded. The programme was run by DTI, a respected body combining business management and innovation expertise. Its equivalent in Ireland could be Forbairt, though in Denmark care was also taken to include other organisations in discussions about the programme. Second, the programme had definite stages which gave a sense of momentum to firms and networks moving from the unfamiliar practice of co-operating, in the first place, through development of a joint action plan, to final implementation for those seeking to reach that stage. Third, the initiative involved having trained intermediaries to facilitate the network formation process and resources sufficient to support that intent. These were available to assist firms in networks to purchase necessary technical consultancy to enable them to innovate managerially or in terms of product or process innovation. This overcame the scepticism of firms towards bureaucracy, on the one hand, and management consultancy on the other.
1. BACKGROUND

(i) Firms and Institutional Change

Until the mid-1980s, the main economic system was as a supplier of agricultural and industrial goods, especially coal and steel. However, during the 1980s, Wales experienced a lengthy period of economic decline, lasting until the effective ending of the miners' strike in the 1980s.

During the post-war years, engineering and other manufacturing industries such as Ferodo, GEC, Ferranti, and Hotpoint were established, often demonstrating their economic viability within a UK economy dependent for a time on traditional sectors recovering from the 1975 energy crisis. There was no obvious pattern other than that they were classical goods industries, seeking and finding shopfloor workers, both male and female, who sourced much of their supplies locally, including items such as packaging and transport.

The establishment of the Welsh Economic Development Council (WEDC) meant that, for the first time, Wales had a strategic economic development council for Wales, not as it were the period of most first-round of manufacturing industries. This strategy took off because this was the period of most first-round of manufacturing industries, from 1983 to 1993 Wales, where economic growth and GDP, consistently attracted both inward investment in the UK and inward investment in Wales.